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ABSTRACT

This second annual report describes activities of and presents Preliminary findings of nine longitudinal studies that are a follow-up of research conducted from 1985 to 1990 by the Early Intervention Research Institute at Utah State University on the effects and costs of providing alternative types of early intervention services to children with disabilities. The nine studies being followed focus on either variations in program intensity, variations in the age of beginning intervention, or variations in program type. The studies are being conducted with various subgroups of children with disabilities (e.g., visually impaired, hearing impaired, severely disabled). The bulk of the report consists of individual reports for each of the nine studies. For each study, information is presented about the alternative forms of intervention being examined and the outcomes for the various measures of child and family functioning. The following studies are presented: (1) New Orleans (Louisiana) Visual Impairment Study #1; (2) South Metropolitan Association/Lake McHenry (Illinois) Intensity Study #2; (3) Arkansas Intensity Study #3; (4) Jordon (Utah) Intensity Study #4; (5) Salt Lake City (Utah) Medically Fragile Study #5; (6) Charleston (South Carolina) Periventricular-Intraventricular Hemorrhage Project (Medically Fragile Study #6); (7) Columbus (Ohio) Medically Fragile Study #7; (8) Des Moines (Iowa) Parent Involvement Study #8; and (9) Utah Parent Involvement Study #9. Contains 220 references. (DB)

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ED 373 477

ANNUAL REPORT FOR PROJECT PERIOD

OCTOBER 1, 1991 - SEPTEMBER 30, 1992

of the

Longitudinal Studies of the Effects of Alternative Types of Early Intervention for Children with Disabilities

Submitted to the

U.S. Department of Education

by the

Early Intervention Research Institute

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Utah State University

October, 1992

EC 303245

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PREFACE

This document contains the second annual report of the ***Longitudinal Studies of the Effects of Alternative Types of Early Intervention for Children with Disabilities***. These studies are a follow-up of research that was conducted from 1985 to 1990 by the Early Intervention Research Institute (EIRI) at Utah State University as a part of a contract (Contract #300-85-0173) with the United States Department of Education. Funding for that project was provided by the U. S. Department of Education as well as the National Institute of Child Health and Human Development and the Office of Maternal and Child Health of the Public Health Service. The original project on which this follow-up research is based began enrolling subjects in 17 different studies in October of 1986. Data were collected for subjects in those 17 studies through the Fall of 1990. At that time, another contract was funded by the Department of Education (Contract #HS90010001) to continue data collection for 9 of the original 17 studies for an additional 3 to 5 years.

Because data collection as a part of the follow-up studies will continue through at least 1993, the data, results, and tentative conclusions contained in this report should be viewed as preliminary. Additional data are being collected, and analyses continue. Furthermore, even though care has been taken to discover key punching, transcription, and computational errors, it is certain that not all such errors have been identified and corrected at this time. As work continues, more up-to-date information on any study reported in this document will be available from the Early Intervention Research Institute.

Staff members contributing to sections of this report included: Glenna Boyce, Diane Behl, Glendon Casto, Linda Goetze, William Eiserman, Mark Innocenti, Lance Mortensen, Conway Saylor, Matthew Taylor, and Karl White. Preparation of the report was done by Mary Ellen Heiner and Vicki Anderson.

BACKGROUND

In the Fall of 1985, the U. S. Department of Education undertook a significant initiative to investigate the longitudinal effects and costs of providing alternative types of early intervention services to children with disabilities. Through a competitively awarded contract to the Early Intervention Research Institute at Utah State University, planning was undertaken for a series of longitudinal studies.

The impetus for this type of a large scale research project stems from at least three sources. First, over the past 25 years, hundreds of research studies have been conducted to investigate the efficacy of early intervention programs for children who are disabled, disadvantaged, or at-risk. Unfortunately, much of this research has suffered from serious methodological flaws, narrow definition of outcomes, and/or inadequately implemented interventions (Dunst & Rheingrover, 1981; Simeonsson, Cooper, & Scheiner, 1982). Most of the research which has been well done, has been done with disadvantaged children, and there are questions about the degree to which findings from research with such children should be used to make decisions about programs for children with disabilities (White & Casto, 1985). Unfortunately, there is very little credible research data which can be used to draw conclusions about what types of early intervention programs are best for which children with disabilities.

Second, during the last 20 years, there has been a dramatic increase in the availability of early intervention programs for children with disabilities. This expansion is expected to continue and even increase with the 1986 passage of Public Law 99-457 which provides significant initiatives for states to mandate early intervention programs for children with disabilities by the Fall of 1991. Although much progress has been made, it is evident that the lack of high-quality research for children with disabilities has been a substantial impediment to improving the quality of early intervention services for such children and their families. Furthermore, the rapid and continuing expansion has increased the need for better information about which early intervention programs are best for which children.

Third, during the last decade, resources for providing human service programs have become increasingly limited. This has led policy makers and program administrators to be more concerned about the costs as well as the effects of all human service programs. With regard to early intervention, there have been increasingly frequent questions about which types of programs are most cost-effective. Unfortunately, very little previous early intervention research has included a cost analysis component.

It was in the context of these three factors: 1) limited high-quality early intervention research for children with disabilities, 2) pressures to expand early intervention programs for children with disabilities, and 3) the almost total absence of efficacy research which includes a cost-analysis component, that the U. S. Department of Education issued a Request for Proposals (RFP) in the Spring of 1985. This RFP called for a contractor to conduct a series of experimental studies investigating the effects and costs of alternative types of early intervention for children with disabilities. The RFP stipulated that each of those studies must be a randomized experiment in which two alternative types of intervention were compared, must consider the effects of the intervention for both children and families, must analyze the costs in conjunction with the effects of the alternative types of intervention, and must be carried out in field-based settings which were representative of state-of-the-art early intervention programs.

The RFP required that one group of studies would investigate the effects of varying the intensity of the intervention program, another series would investigate variations in the age at which the comprehensive intervention program began, and a final group of studies would investigate the effects of program variation. These studies were to be done with various subgroups of children with disabilities (e.g., visually impaired, hearing impaired, severely disabled, etc.) instead of with disadvantaged or at-risk children. The contract provided funding for a 5-year period so that the effects of intervention could be assessed longitudinally, but the money was limited to actually conducting the research and was not to be used to fund the intervention programs.

Specifications for the contract required a series of feasibility studies during the first year (1985-86), after which the government would decide whether it would proceed with all or part of the proposed research workscope. Based on the work done during that first year (1985-86), the government decided to proceed with all of the work outlined in the original RFP. (A report of that work can be found in ERIC Document Reproduction Services #ED 202089.) As a result of the government's decision, the ***Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children*** were initiated in October of 1986 and continued through December 31, 1990. A subsequent, competitively awarded, contract was then initiated (Contract #HS90010001) to continue to collect data for 9 of the original 17 studies so that the long-term effects of early intervention for children with disabilities could be more completely assessed.

The purpose of this report is to summarize the activities and results of research during the second year of the follow-up research for the ***Longitudinal Studies of the Effects of Alternative Types of Early Intervention for Children with Disabilities***. The design and results of each individual study will be discussed.

During the 1991-92 year, individual site coordinators continued to make periodic site visits and regular telephone contacts with each of the sites. Site coordinators supervised the collection of treatment verification and outcome data at each of the sites. Because of turnover in diagnosticians, it was necessary to continue to train a few diagnosticians. Monitoring procedures were continued to ensure high-quality assessments. Management of the experimental comparisons at each of the sites required ongoing attention to make sure that appropriate data were collected and that the implementation of alternative interventions were continuing as planned. The early intervention programs in a number of the sites were no longer operational for children participating in the research since these children had "graduated" into public school programs. Arrangements were made to continue to follow those children and collect data annually. As outcome data were collected, site coordinators were responsible for cleaning, double checking, and entering the data into the computer for subsequent analyses.

The important task of minimizing attrition among participating child and families continued as a major responsibility of site coordinators. Children who had completed early intervention programs and moved to other parts of the country were located whenever possible and tested at appropriate times. In other cases, children had moved within the same geographic area and had to be relocated before testing could be done. In most sites, the efforts to relocate children have been successful, and the posttest data included in this final report often includes more children than the posttest data from the 1988-89 year. The importance of having liaison people located at each of the sites has been emphasized in this process.

The training of graduate students and their involvement in the **Longitudinal Studies** continued as an important part of the contractual workscope for the project. During 1991-92, 14 different graduate students from special education, family and human development, economics, and psychology were actively involved in the workscope of the **Longitudinal Studies**. Their responsibilities included supervision of data collection and coding, telephone interviews with parents, data analysis and interpretation, and report writing. In addition to these students who were employed an average of 20 hours per week, many additional graduate students from Utah State University and other universities were trained and certified to do educational assessments as a part of the **Longitudinal Studies'** workscope. These students were paid according to the number of assessments they completed.

The activities of the staff regarding dissemination of project results also increased. As more data has been collected, the results of these studies have been presented at national meetings and submitted to journals for publication.

The bulk of this report contains individual reports for each of the nine studies included in this project. Before presenting those detailed reports, a summary of the design and results of each study is presented. The following pages describe the most critical information about the design of each study and graphically summarizes the results for child and family outcomes. These tabular and graphical representatives are best interpreted in conjunction with the remainder of the final report from the Early Intervention Research Institute and should not be viewed as an adequate substitute for that report.

Two pieces of information are presented for each study. The first contains information about the alternative forms of intervention which were being examined. The second page contains a graphic summary of the outcomes for the various measures of child and family functioning. This graph is interpreted as follows (see Figure 1). Outcome measures are listed down the left side of the page. Each graph has a vertical line down the center of the remainder of the page. Numbers opposite each outcome measure indicate whether it is the first posttest (represented by "1"), second posttest (represented by "2"), etc. The location of the number with respect to the vertical line indicates the results for that test. If the number is to the left of the line, the group on the left side of the line did better. The distance from the vertical line represents the size of the effect in standard deviation units. If a number has an asterix by it, the result was statistically significant at $p \leq .10$.

To illustrate for one study, consider the Jordan Intensity Study on pages 142 to 187. Two groups (3 days a week vs. 5 days a week) were compared on a variety of measures of child and family functioning. The result for the Battelle Developmental Inventory's cognitive subtest was about .27 standard deviation units in favor of the 5-day-per-week group at the first posttest (statistically significant at $p \leq .10$) and .07 standard deviation units (not statistically significant) in favor of the 3-day-per-week group at Posttest #2. Larger bold numbers indicate the average effect for all child or all family measures for a particular posttest.

The interpretation of the results of each study depend on the **pattern** of results for the entire set of dependent variables as much as the individual results for various measures. This type of graphic representation provides a summary of the magnitude, direction, and statistical significance of a large number of measures which are useful in interpreting the overall effect of the alternative types of intervention.

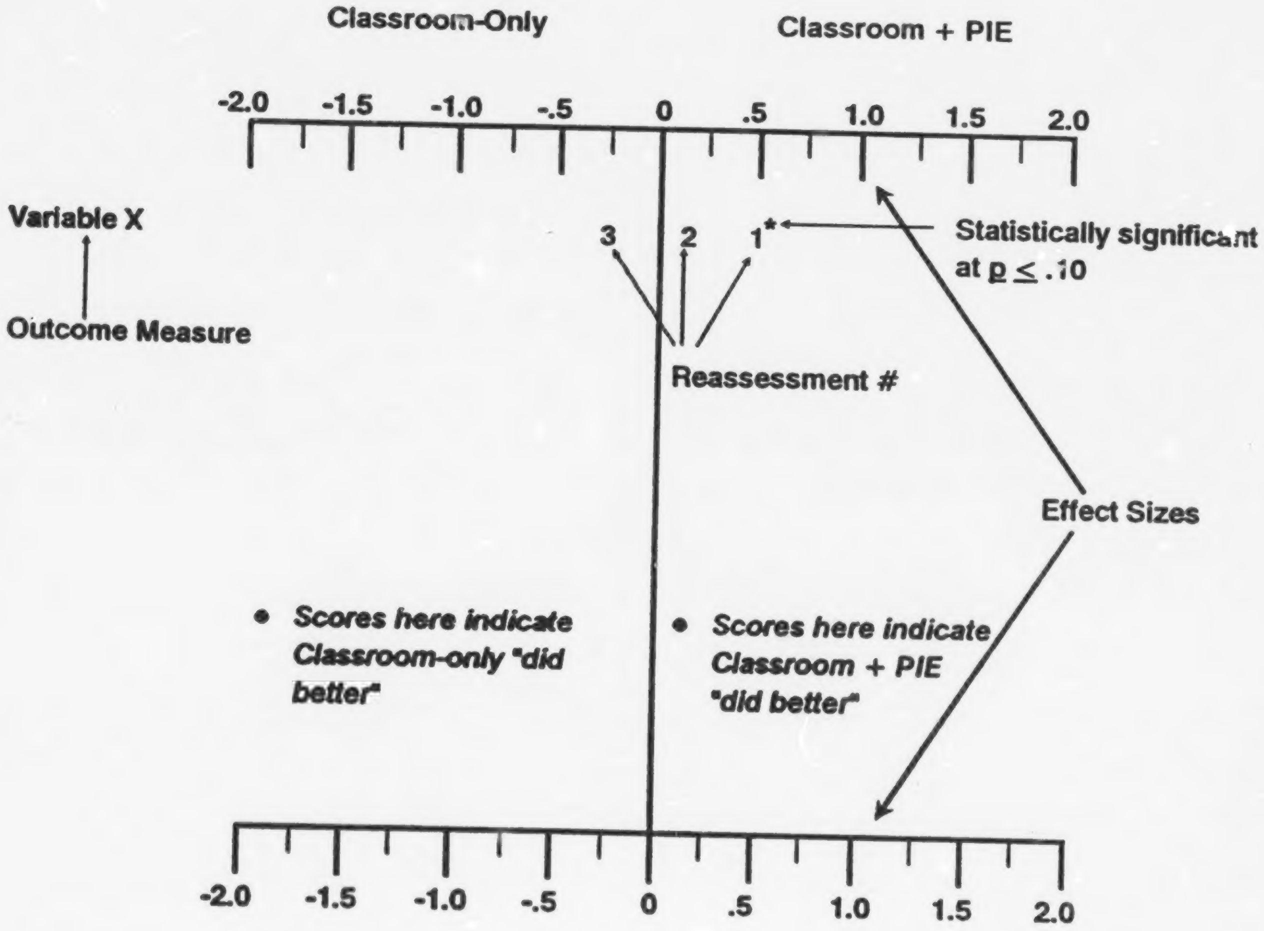

Classroom-Only
Classroom + PIE
-2.0
-1.5
-1.0
-.5
0
.5
1.0
1.5
2.0
Variable X
Outcome Measure
3
2
1*
Statistically significant at p ≤ .10
Reassessment #
Effect Sizes
• Scores here indicate Classroom-only "did better"
• Scores here indicate Classroom + PIE "did better"

Figure 1: Results Presentation Key

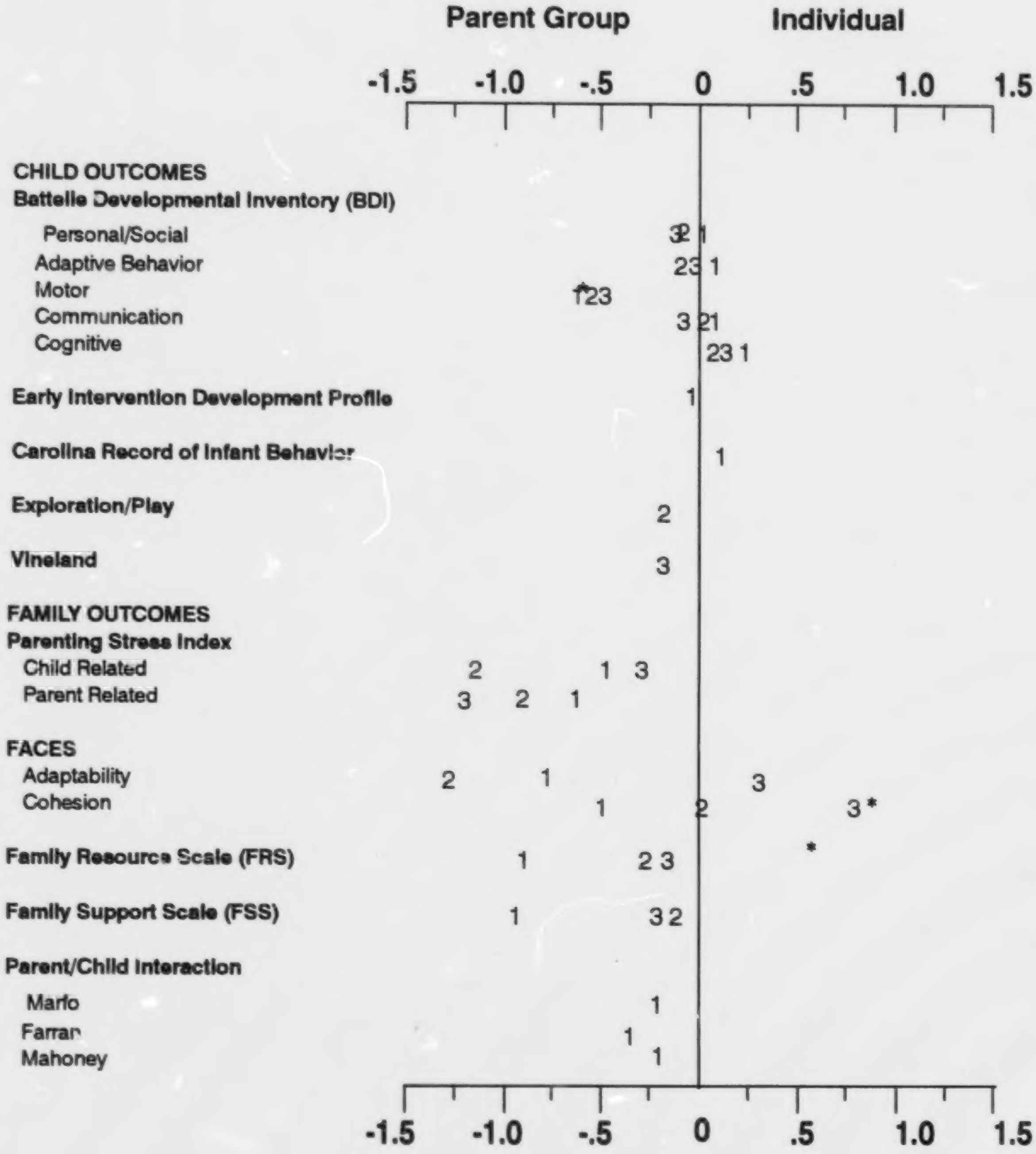
NEW ORLEANS VISUAL IMPAIRMENT STUDY #1

Design

- 30 Infants/toddlers with mild-severe visual impairments randomly assigned to 2 interventions.

Low Intensity	High Intensity
• Contact with family average of 1 time per month	• Contact with family 4 times per month
• Contact with parent only	• Contact with parent and child
• General information related to VI given to parents	• Individualized Family Service Program for child and family
• Parents seen in a small group	• Parents seen individually
• Meetings held at the center	• Most visits with parents at their homes
• Variety of guest speakers	• Consistent primary intervenor (i.e., certified special education teacher and social worker)
• Group presentations by doctors, educators, therapists re: -- child development -- effects of visual impairment on development -- information regarding etiologies -- Reach Out and Teach Handbooks	• Individualized consultation with O.T., P.T., speech/language therapist
	• Intervention based on: -- Louisiana Curriculum -- Reach Out and Teach Handbooks -- Naturalistic teaching opportunities -- Focus on family and environment

NEW ORLEANS VISUAL IMPAIRMENT STUDY



SMA/LAKE MCHENRY INTENSITY STUDY #2

Design

- 72 children with disabilities randomly assigned to receive early intervention services 3 times per week versus 1 time per week.

- Services provided primarily at center by parent-infant educator. Some home services provided if transportation is a problem.

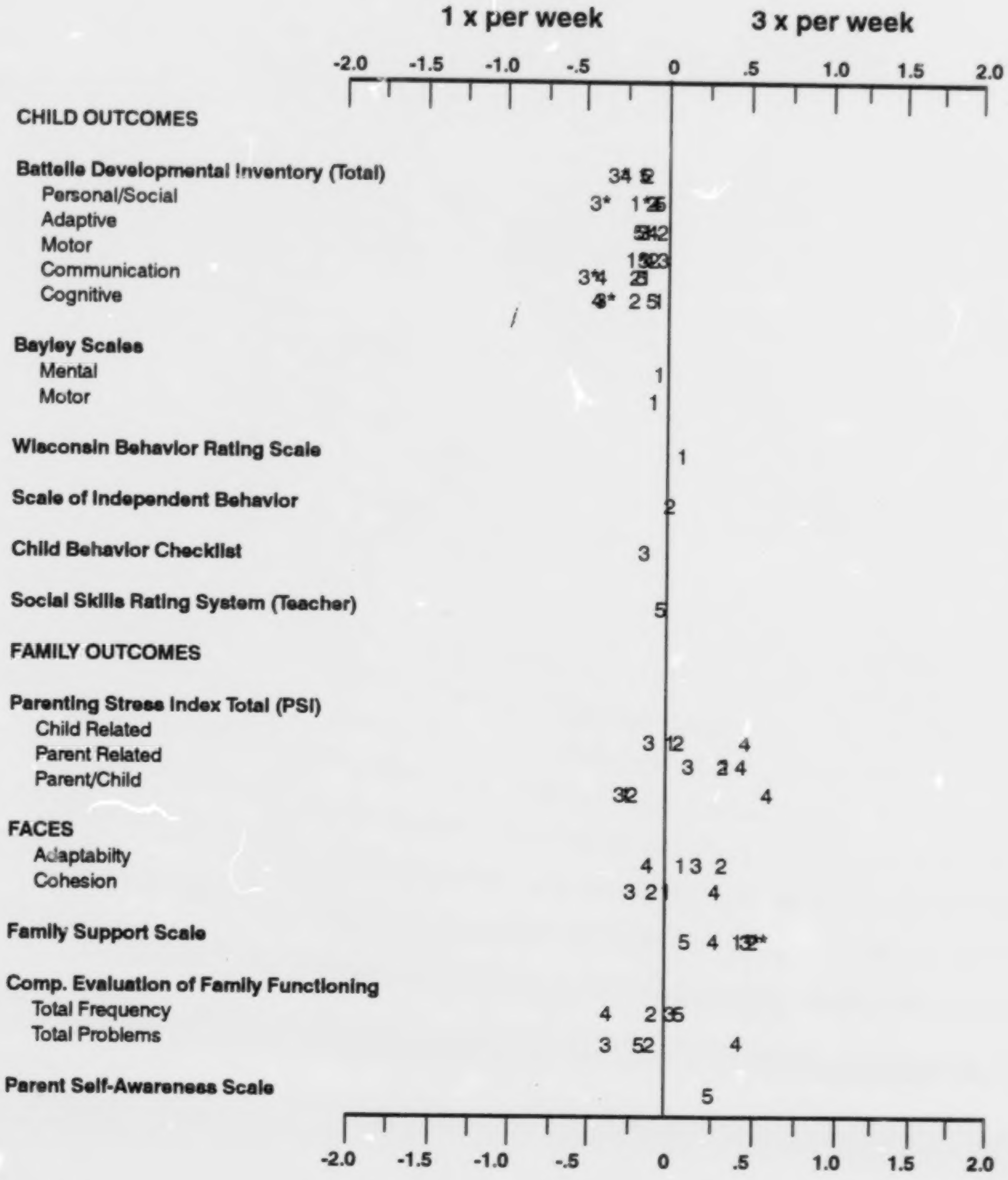
- Content of IEP driven by child assessment and family needs, but no specific curriculum used.

- Intervention focused on development in:

  -- personal/social
  -- adaptive behavior
  -- motor
  -- language
  -- cognitive

- Parents were expected to learn intervention techniques and implement them at home as appropriate. Program also provided emotional support to parents and assisted parents to obtain needed assistance outside the program.

SMA Intensity Study



ARKANSAS INTENSITY STUDY #3

Design

- 77 3- to 48-month-old children with disabilities randomly assigned to standard (1 time per week) or expanded (2 times per week) home-based interventions.

- Services provided by 9 home visitors, each of whom provided services to some children in each group.

- Intervenors worked directly with the child; parents expected to observe, do follow-up activities, and keep data between visits.

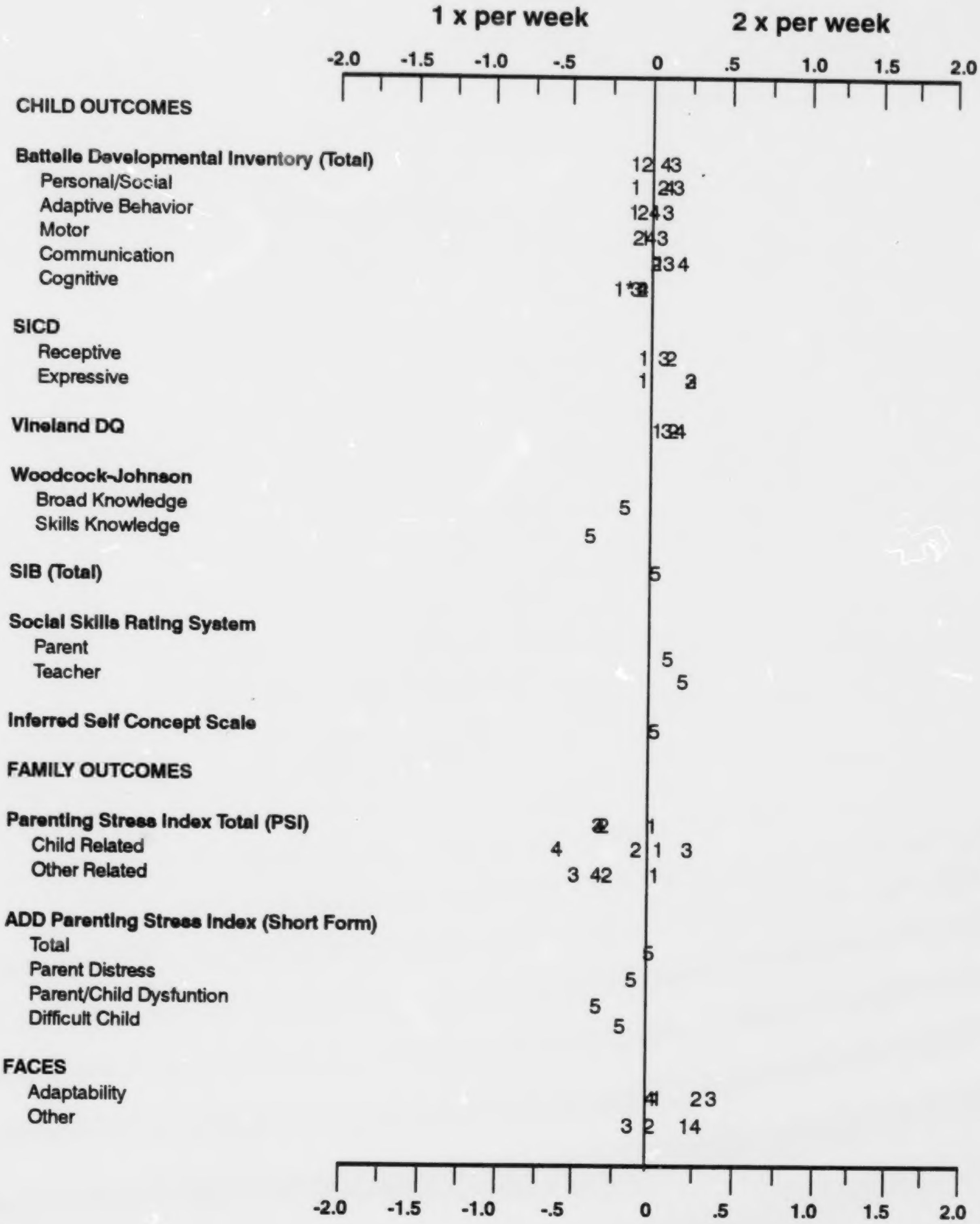
- Intervention focused on development of functional skills in all developmental areas as specified by IEP. Most frequent areas of emphasis:

  -- self help (particularly feeding)
  -- gross motor
  -- communication

- Additional speech or motor therapy provided as needed in a center-based program.

- Parents were expected to learn intervention techniques and implement them at home as appropriate. Program also provided emotional support to parents and assisted parents to obtain needed assistance outside the program.

ARKANSAS INTENSITY STUDY



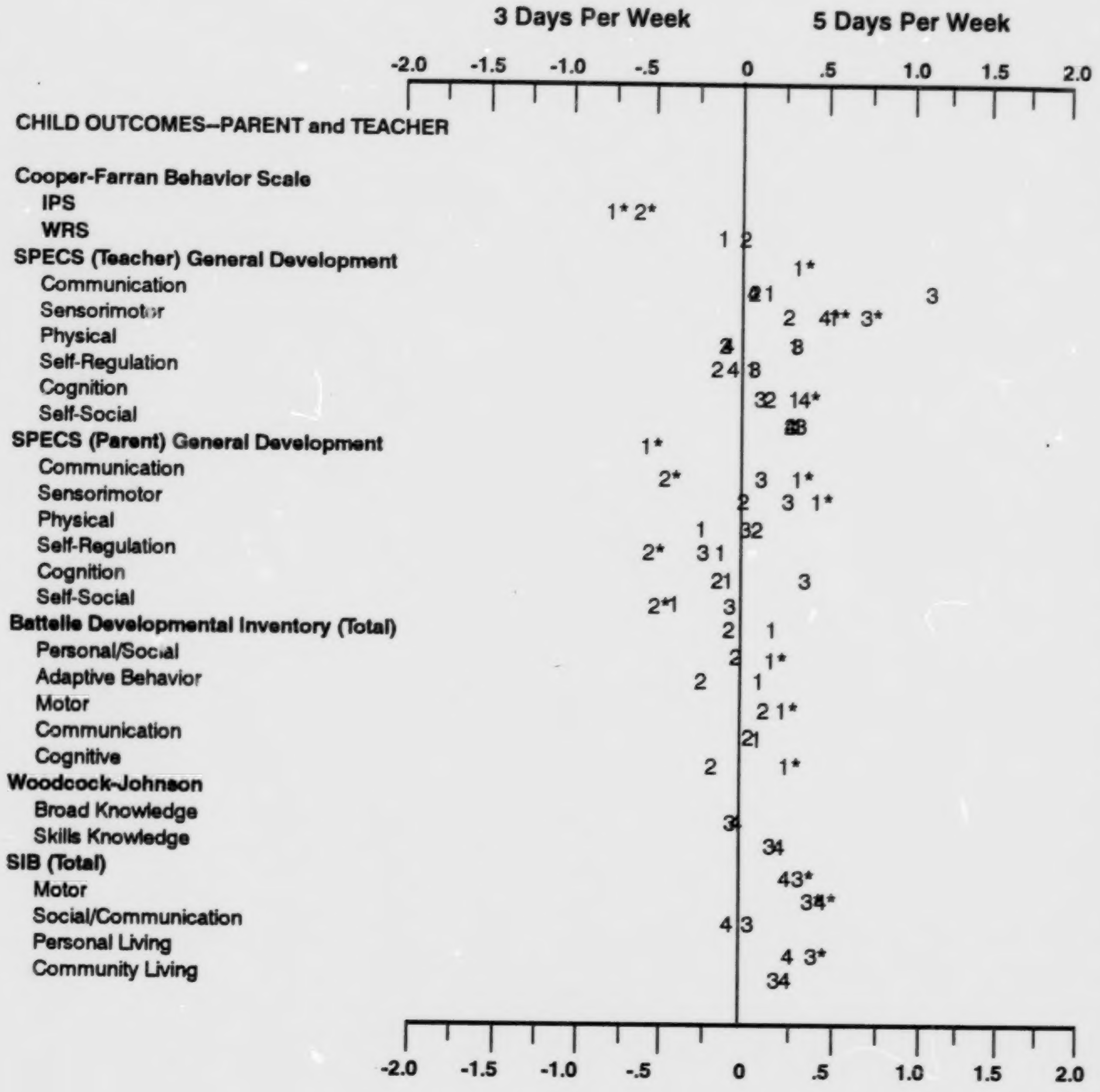
JORDAN INTENSITY STUDY #4

Design

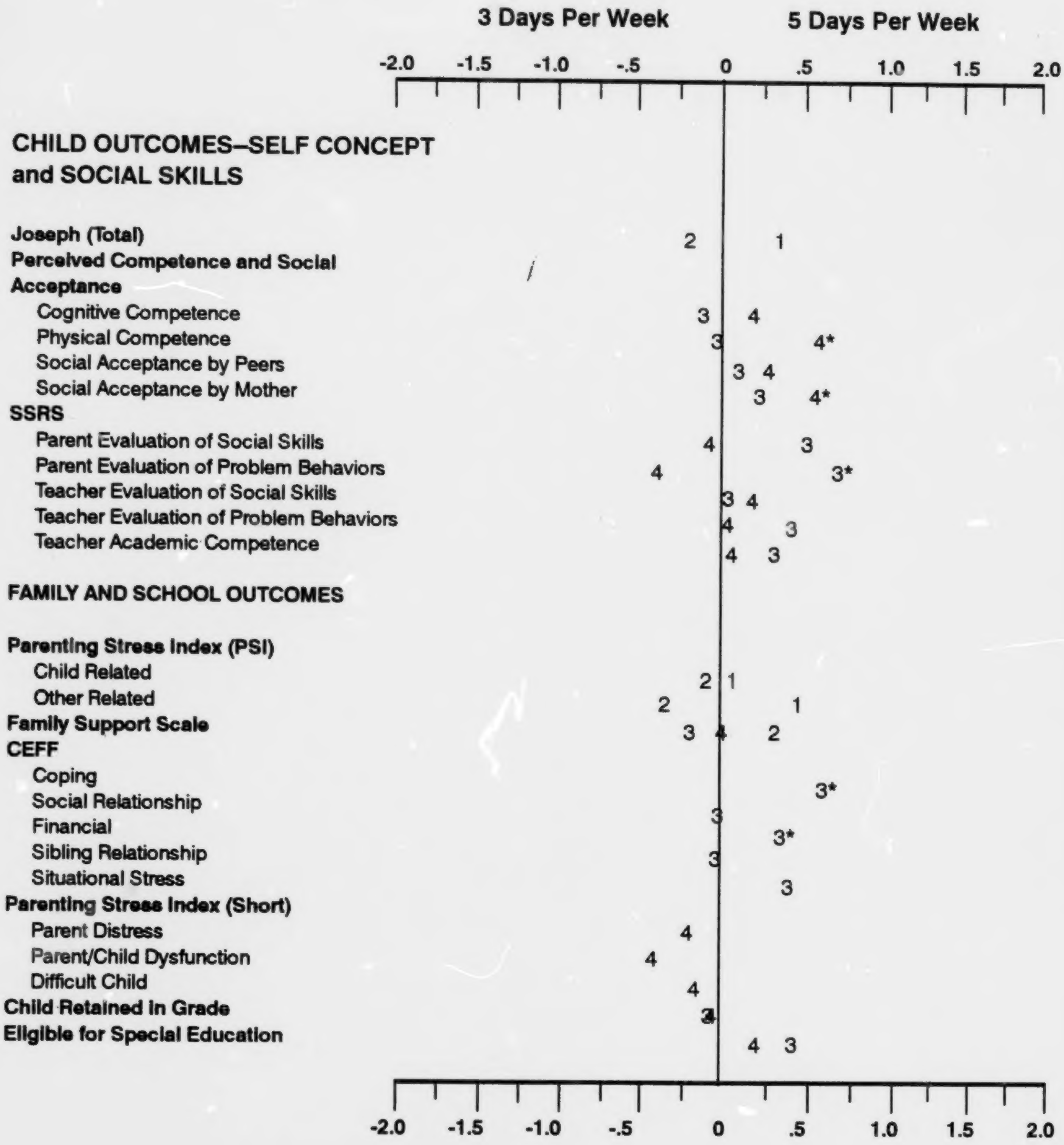
- 53 preschool-aged children with severe to mild disabilities randomly assigned to two intervention groups.

Less Intensive Intervention Program	More Intensive Intervention Program
• 3 days per week; 2 hours per day	• 5 days per week; 2 hours per day
• 1:5 teacher/child ratio	• 1:3 teacher/child ratio
• One teacher assisted by two paraprofessional aides	• One teacher assisted by four paraprofessional aides
• Communication therapist available in classroom every other day	• Communication therapist available in classroom every day
• Intervention based on IEP using varied curricula through a theme-based, developmentally appropriate approach focused on teaching skills during daily activities	• Intervention based on IEP using varied curricula through a theme-based, developmentally appropriate approach focused on teaching skills during daily activities

JORDAN INTENSITY STUDY



JORDAN INTENSITY STUDY
(CONTINUED)



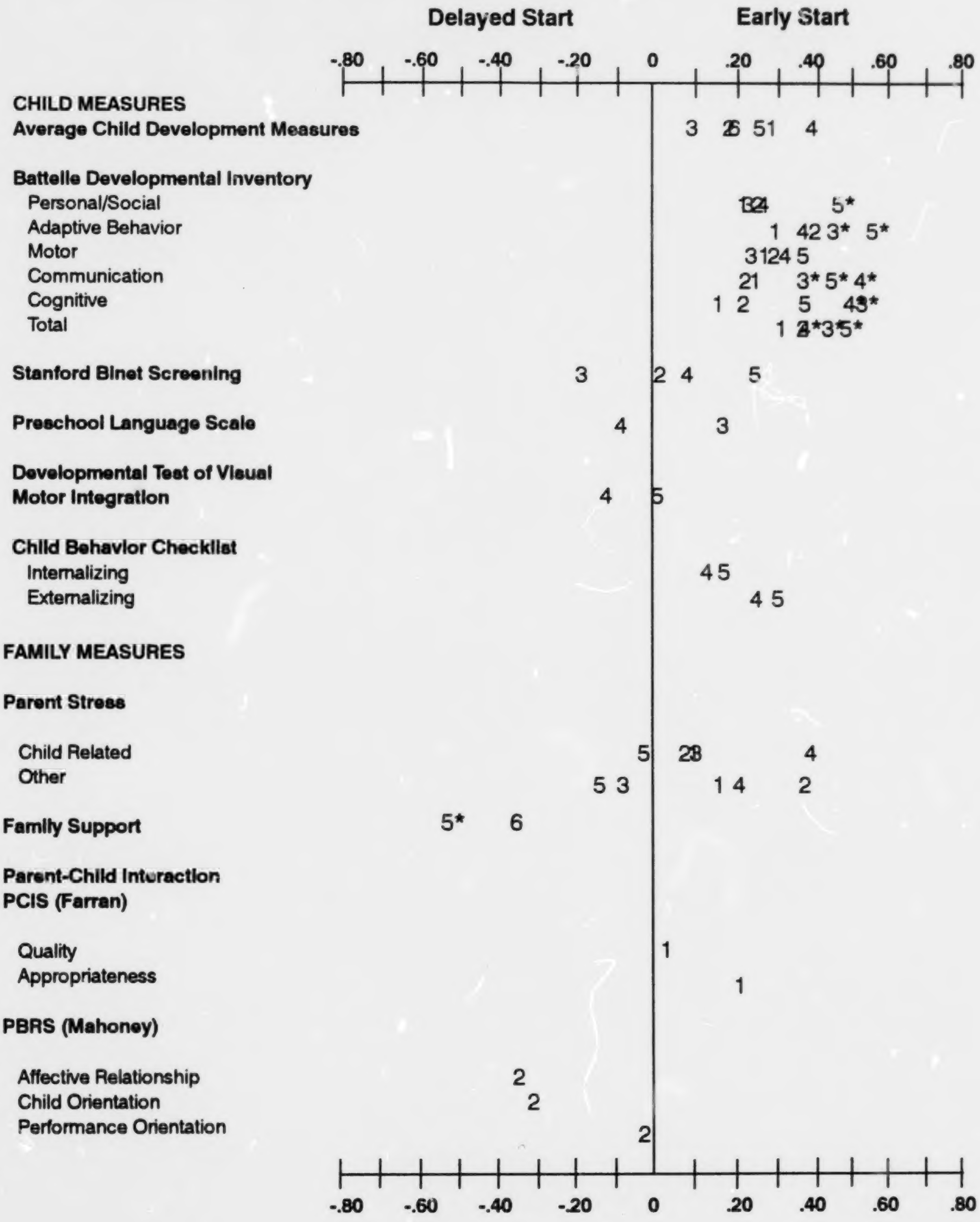
SALT LAKE CITY MEDICALLY FRAGILE STUDY #5

Design

- 58 infants with intraventricular hemorrhage (IVH) randomly assigned to 2 intervention groups.

Delayed Intervention	Early Intervention
3 Months Corrected Age	**3 Months Corrected Age**
• Medical follow-up: Utah State Department of Health neonatal Follow-up Clinic or private physician	• Medical follow-up: Utah State Department of Health Neonatal Follow-up Clinic or private physician
	• Sensorimotor intervention -- Registered physical/occupational therapist -- Curriculum and Monitoring System (CAMS) Motor Program -- 1:1 child/therapist ratio -- Parent instruction -- Monthly to weekly visits -- Home-and/or center-based
	• Assistance in locating community services
18 Months Corrected Age	**18 Months Corrected Age**
• Sensorimotor intervention	• Sensorimotor intervention
• Developmental intervention	• Developmental intervention
• Certified teacher	• Certified teacher
• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)	• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)
• Parent instruction	• Parent instruction
• Monthly visits	• Monthly visits
• Home- and/or center-based	• Home- and/or center-based
• Assistance in locating community services	• Assistance in locating community services

SALT LAKE CITY MEDICALLY FRAGILE STUDY



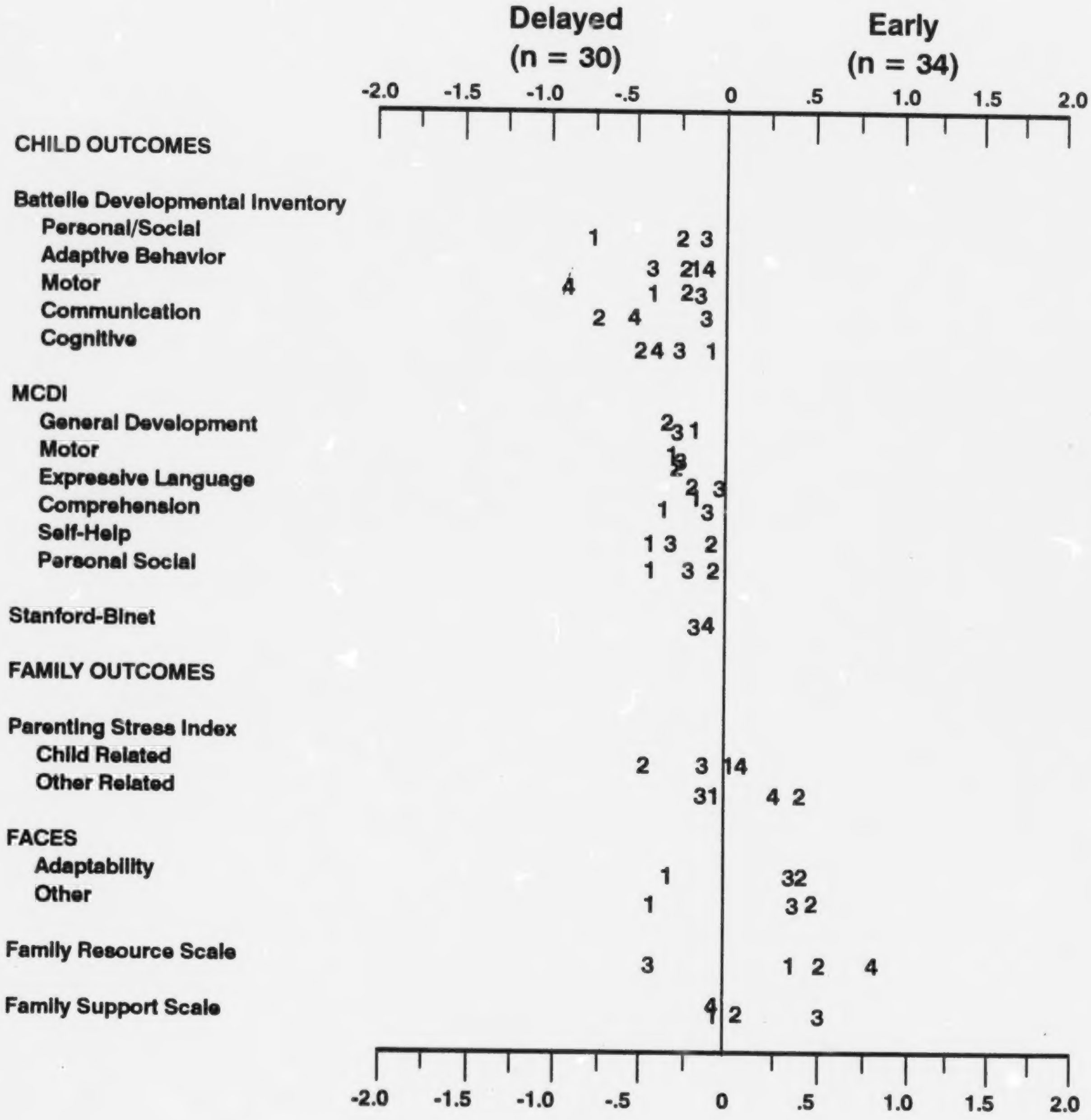
SOUTH CAROLINA MEDICALLY FRAGILE STUDY #6

Design

- 68 infants who were born prematurely and suffered major complications including intraventricular hemorrhage (IVH) and very low birthweight (< 1000 g), recruited in the hospital before discharge and randomly assigned to two groups.

Delayed Intervention	Early Intervention
3 Months Corrected Age	**3 Months Corrected Age**
• Medical follow-up: South Carolina Department of Health neonatal Follow-up Clinic or private physician	• Medical follow-up: South Carolina Department of Health Neonatal Follow-up Clinic or private physician
	• Sensorimotor intervention -- Registered physical/occupational therapist -- Curriculum and Monitoring System (CAMS) Motor Program -- 1:1 child/therapist ratio -- Parent instruction -- Monthly to weekly visits -- Home-and/or center-based
	• Assistance in locating community services
18 Months Corrected Age	**18 Months Corrected Age**
• Sensorimotor intervention	• Sensorimotor intervention
• Developmental intervention	• Developmental intervention
• Certified teacher	• Certified teacher
• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)	• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)
• Parent instruction	• Parent instruction
• Monthly visits	• Monthly visits
• Home- and/or center-based	• Home- and/or center-based
• Assistance in locating community services	• Assistance in locating community services

South Carolina Medically Fragile Study



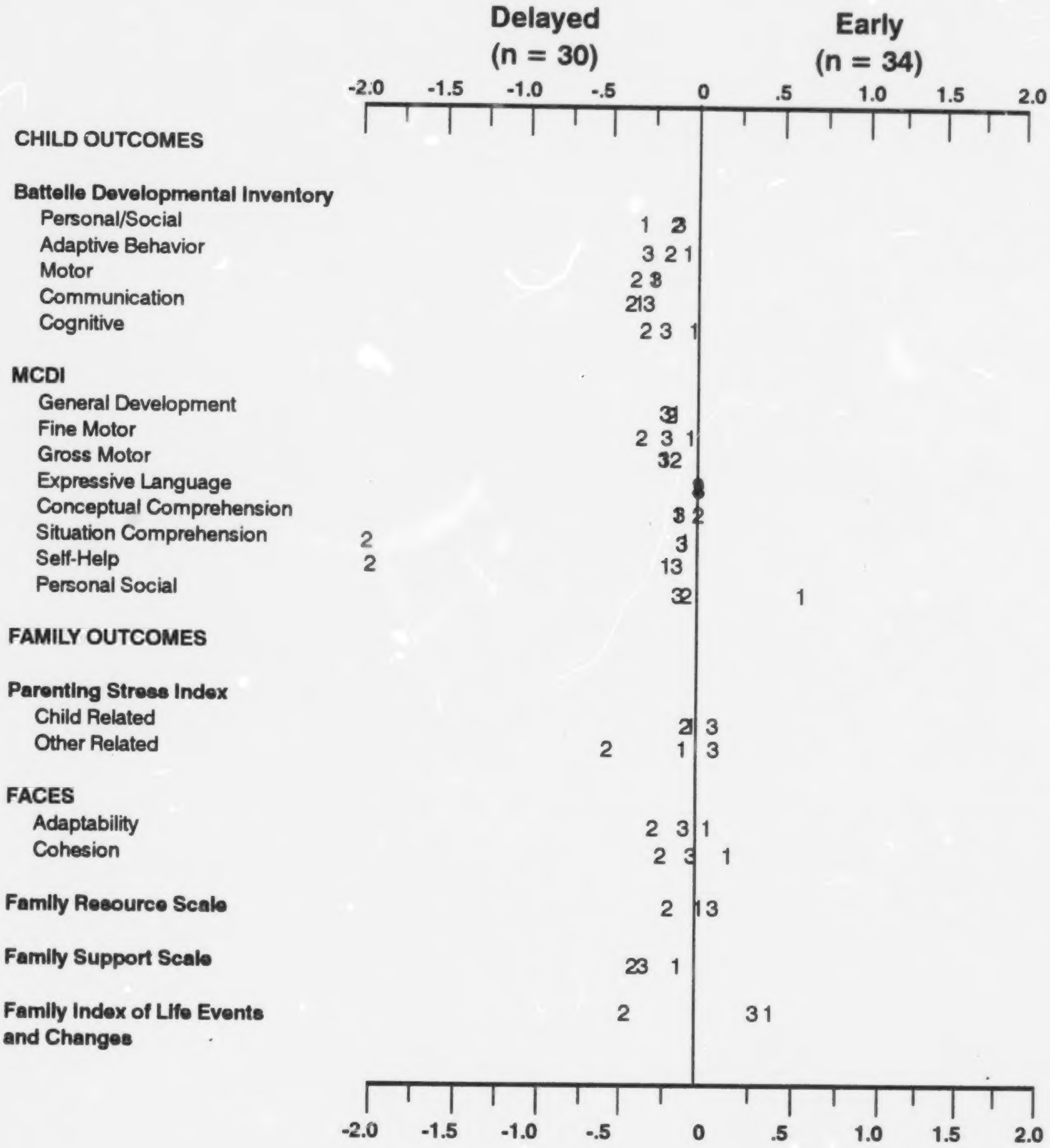
COLUMBUS MEDICALLY FRAGILE STUDY #7

Design

- 50 infants diagnosed with bronchopulmonary dysplasia (BPD) or neurological damage randomly assigned to two intervention groups.

Low Intensity Intervention	High Intensity Intervention
• Medical and developmental follow-up through NICU follow-up clinic	• Medical and developmental follow-up through NICU follow-up clinic
• Referral to community services	• Transition services from NICU to home-based community services -- Predischarge hospital visits -- Referral to local collaborative group -- Collaborative home visits from local providers
	• Coordinated interdisciplinary early intervention services based on IFSPs -- Nursing and medical -- OT/PT -- Developmental -- Social Services -- Medical technology personnel
• Referral to local school district or MR/DD programs at age 3	• Referral to local school district or MR/DD programs at age 3

South Carolina Medically Fragile Study



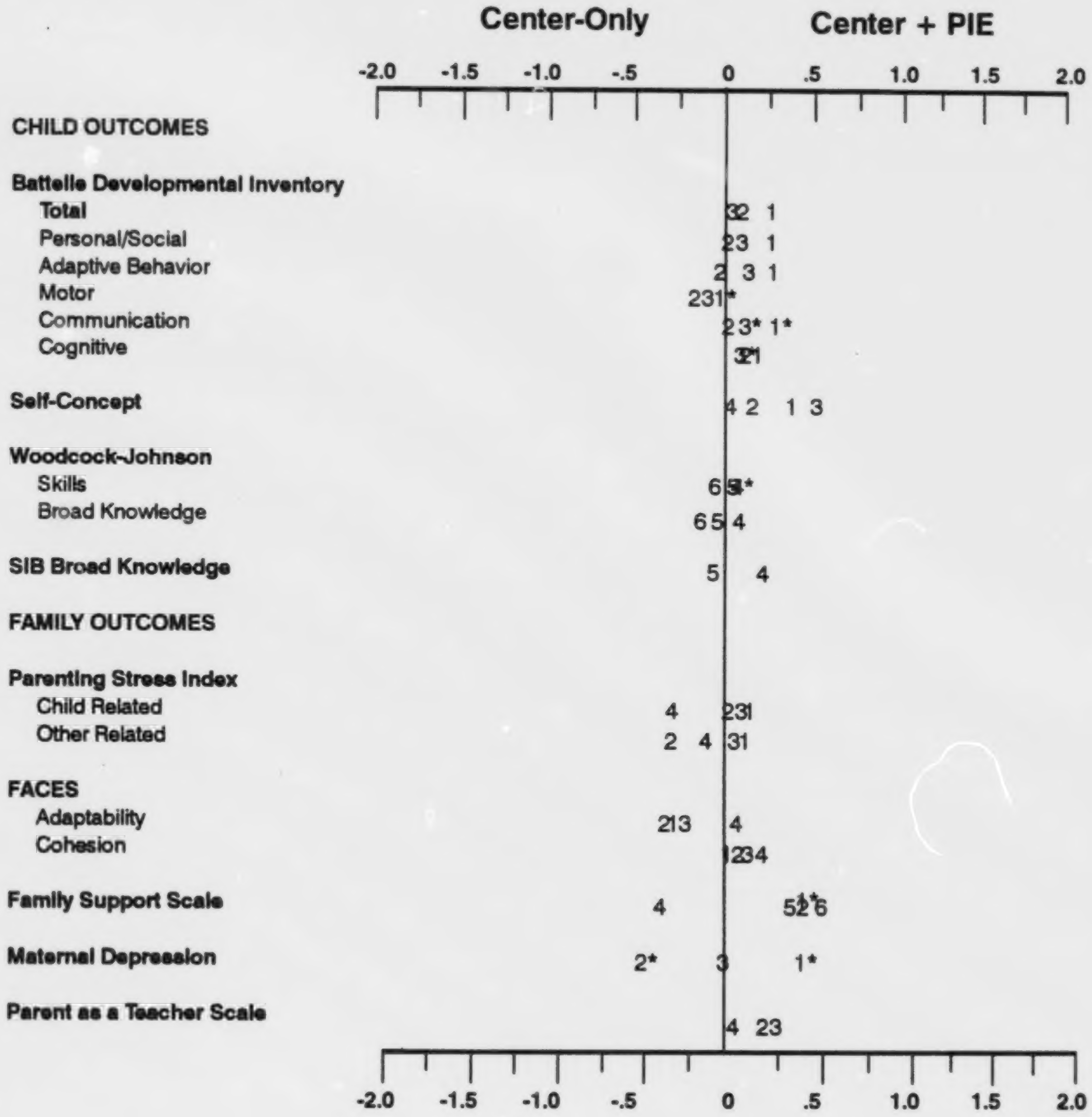
DES MOINES PARENT INVOLVEMENT STUDY #8

Design

- 76 children with mild to severe disabilities randomly assigned to two intervention groups.

Center-Based Intervention	Center-Based Intervention + P.I.E. Curriculum
• 5 days per week; 2½ hours per day	• 5 days per week; 2½ hours per day
• 10 children per class	• 10 children per class
• Certified teachers by aides	• Certified teachers by aides
• 5:1 child/teacher ratio	• 5:1 child/teacher ratio
• Therapists in class 1 time per week	• Therapists in class 1 time per week
• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development	• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development
	P.I.E. I
	• Parents attended 16, 2-hour sessions approximately once per week.
	• Sessions emphasized: -- Training in teaching/management skills -- Information exchange -- Social support and networking
	• Each parent selected and implemented an individually tailored intervention with their child (15 minutes/day, 3-5 times per week)
	P.I.E. II (for subjects receiving 2 years of intervention)
	• Developed based on parent needs assessment
	• Consisted of 12 2-hour sessions
	• Sessions emphasized: -- Information exchange -- Family support -- Social Support

DES MOINES PARENT INVOLVEMENT STUDY



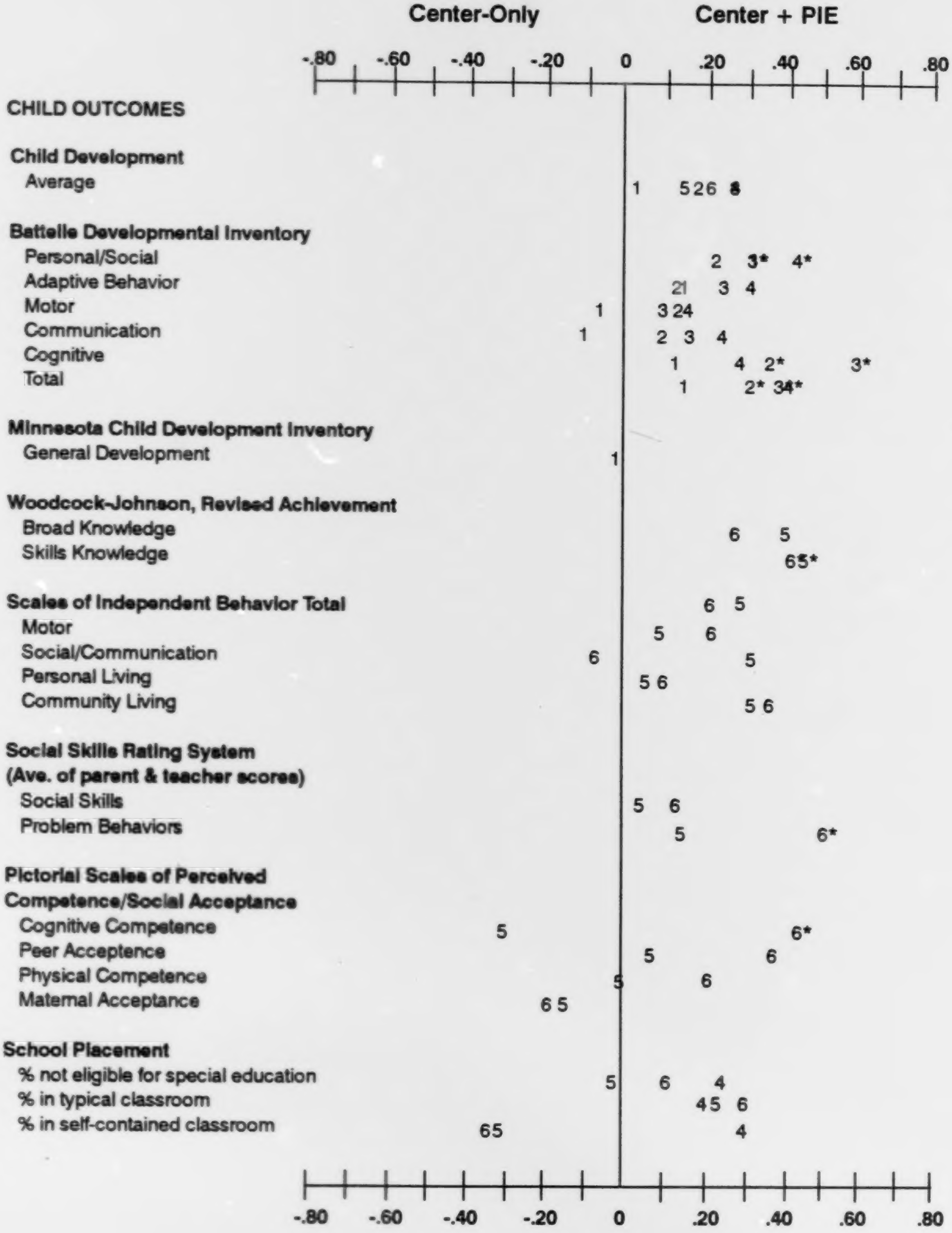
UTAH PARENT INVOLVEMENT STUDY #9

Design

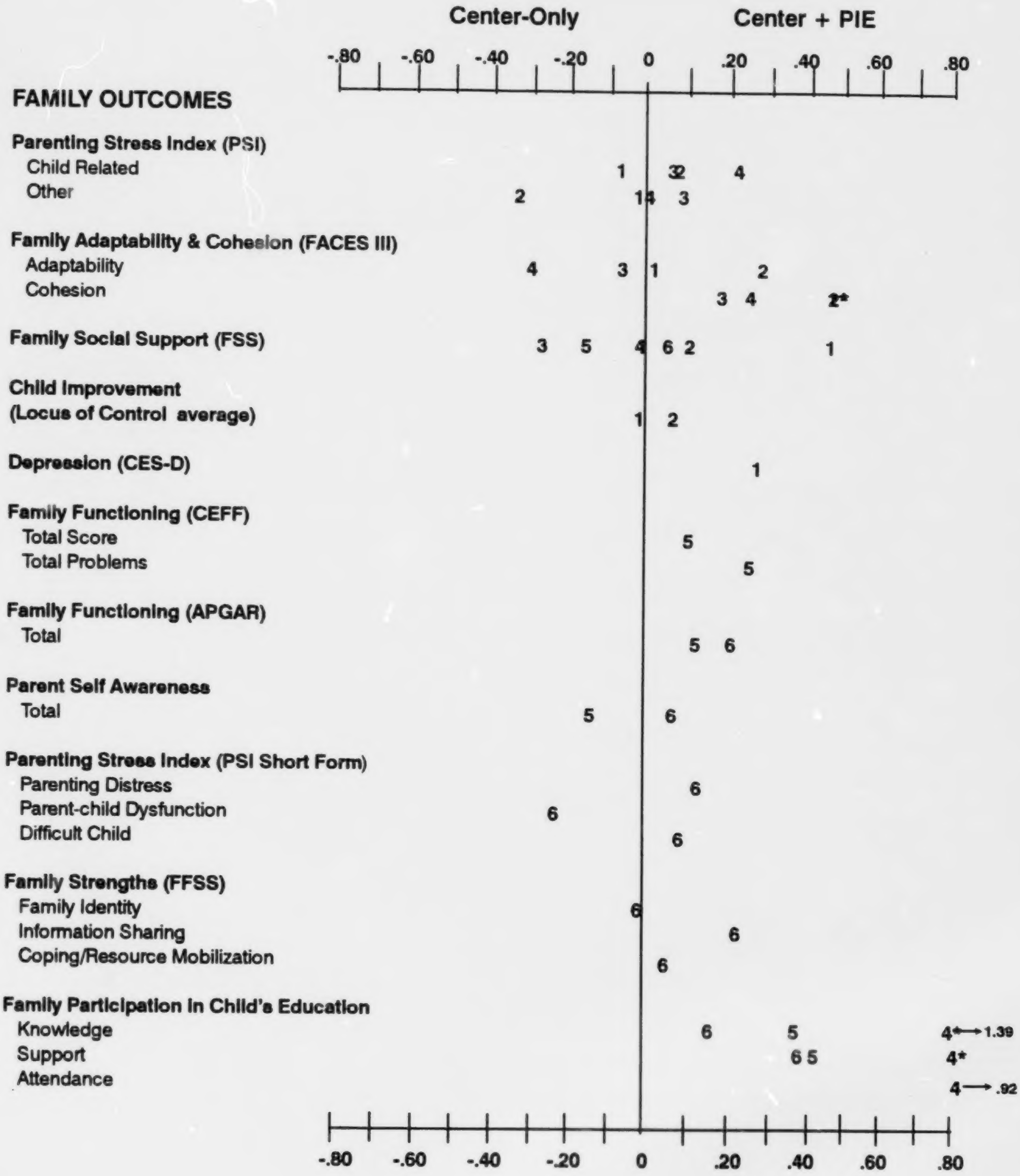
- 58 children with mild to severe disabilities randomly assigned to two intervention groups.

Center-Based Intervention	Center-Based Intervention + P.I.E. Curriculum
• 5 days per week; 3 hours per day	• 5 days per week; 3 hours per day
• 10 children per class	• 10 children per class
• Certified teachers by aides and therapists	• Certified teachers by aides and therapists
• 3.6:1 child/teacher ratio	• 3.6:1 child/teacher ratio
• Therapists in class 1 time per week	• Therapists in class 1 time per week
• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development	• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development
	• Parents attended 15 2-hour instructional sessions discussing: -- Observation of child behavior -- Defining and measuring behavior -- Theories of child development -- Criterion-referenced assessment -- Understanding 94-142 and IEPs -- Successful intervention strategies -- Selecting and implementing interventions -- Communicating with professionals -- Stress management
	• Social support and networking component
	• Each parent selected and implemented an individually tailored intervention with their child (15 minutes per day, 3-5 times per week)

UTAH PARENT INVOLVEMENT STUDY



Utah Parent Involvement Study



NEW ORLEANS VISUAL IMPAIRMENT STUDY (NO/VI)

Project #1

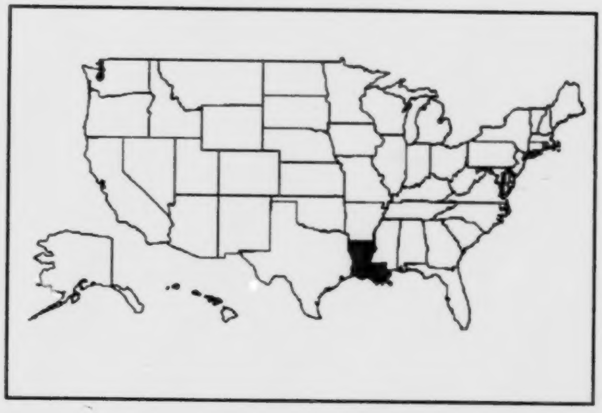
COMPARISON: Children with Visual Impairments -- Weekly individualized parent-infant sessions versus parent group meetings.

EIRI COORDINATOR: Diane Behl

LOCATION: New Orleans, Louisiana

DATE OF REPORT: 10-1-1992

Rationale for Study



The importance of sight in early development is crucial (see discussions by Barraga, 1986; Ferrell, 1986; Fraiberg, 1977; and Warren, 1984). By age three, infants with visual impairments often demonstrate socio-communicative and cognitive development patterns that are quantitatively and qualitatively different from their sighted peers (Ferrell, 1986; Warren, 1984). Ferrell (1986) stated that all of these secondary disabilities are preventable; they occur because there has not been sufficient, systematic intervention given to the child and his/her family. Although such a position is logical, there is little evidence in the literature which either confirms or refutes the value of systematic intervention in alleviating these secondary disabilities (Warren, 1984).

Visual impairment also causes a disruption in the interaction between the caregiver and child. Als (1983) observed that the infant with visual impairments signals and communicates differently. These signals are often distorted and difficult to interpret, making positive, constructive interaction even more difficult for parents who often are attempting to cope with the emotions of having an infant with a disability. Rowland (1984) summarized the position of most researchers involved with children with visual impairments by stating, "The importance of appropriate exchanges between mothers and infants cannot be overstressed."

Though the importance of early intervention for children with visual impairments and their families has been stated frequently in the literature, few controlled prospective studies have been completed with these children, especially at the infant and toddler levels (Warren, 1984). Furthermore, even though researchers speculate that intensive intervention for both child and family is necessary, there is a dearth of evidence regarding the intensity with which this intervention should be provided. Additionally, little data are found to assist in answering the question of how to provide the best intervention (White et al., 1985-86).

This study of early intervention for infants and toddlers with visual impairments compares the immediate and long-term effects of a comprehensive, home-based intervention in the form of one time per week parent-child sessions, with a much lower intensity treatment of informal parent group meetings held approximately 12 times per year. To set the context for this study, existing research on the effects of early intervention with visually impaired children will first be summarized briefly. A description of this study follows, providing a description of the subjects and the alternative interventions, as well as the research procedures. Results based on the study to date will be presented along with conclusions.

Review of Related Research

Since 1969, 11 studies with children with visual impairments have investigated the effectiveness of early intervention. The nature of these studies, including subjects, intervention, outcome measures, and results are summarized in Table 1.1. Unfortunately, as will be discussed, critical components necessary for the results of these studies to be considered well-controlled investigations were lacking.

Table 1.1

Summary of Early Intervention Studies Involving Children with Visual Impairments

Reference	Children (age, n)	Intervention Descript.	Experimental Design	Outcome Measures	Conclusions	Weaknesses
Adelson & Fraiberg (1974)	10 infants, mod-severely VI, no other disabilities.	Bimonthly home visits for 1-2 years. Developmental guidance program linking sound and touch in play and parent-infant interactions.	Posttest only compared with sighted control and with large group of VI infants from earlier study.	Gross Motor items from Gessell & Amatruda; Bayley Scales of Infant Development.	Intervention can accelerate development of mobility in children with visual impairments.	-- Small sample size. -- Comparison VI group had almost 3 times as many premature infants or had later entry ages. -- No random assignment, no naive testers. -- Control group used different outcome measures.
Allegheny County Schools (1969)	Seven preschoolers, all legally blind with varying developmental levels.	6 weeks of center-based training emphasizing exploration and independence.	Pre-posttest	Orientation and mobility of Young and Blind Children (Lord, 1967). Body image of Blind Children Screening Test (American Foundation). Video tapes over time.	Intervention improved several aspects of self-help, vision, and socialization.	-- Small sample. -- No control group. -- Possibly had inconsistent program. -- No treatment verification. -- No mention of naive testers
Bregani et al. (1981)	8 infants and toddlers with ROP.	Weekly 1-hour visits for 1 year focused on parent-child interaction.	Pre-posttest	Brunet-Lezine Scale of Psychomotor Development, Neurological and ocular exams.	Intervention had positive effects on mother-infant dyads presumed to be at-risk for psychotic disturbances.	-- Small sample. -- No control group. -- No mention of naive testers.
Correa, Poulson, & Salzburg (1984)	3 preschool children, severely multiply handicapped.	One-time training in reach-grasp responding conducted in a center.	Multiple baseline design.	Recording of reach-grasp responses.	Intervention effective for training motor skills in blind, severely retarded preschoolers.	-- Small sample. -- No control group. -- Multihandicapped
Fraiberg (1977)	10 blind infants, no other disabilities	Twice-monthly home visits for three years focusing on parent-child interactions.	Pre-posttest.	Videotaped performance.	Intervention improved VI children to levels closer to sighted children than blind children who received no intervention.	-- Small sample size. -- No control group. -- No mention of naive testers.
Harley, Long, Merbler, & Wood (1986)	Infants, 0-2 years, multiply impaired, 22 participants blind or no useful vision	Orientation and mobility training, 16 weeks--Cognitive, motor, sensory development training conducted with some at home, some in the center, used graduated guidance.	Repeated measures or treatments by subject paradigm analyzed pre-post gain scores.	Peabody Mobility Kit for Infants, Parent Satisfaction	Proported high level of parent satisfaction. Programmed intervention was successful with statistically significant gains in Cognitive, movement, and skill areas. No significant gains in motor or sound local.	-- Confounded by additional services -- Experimental intervention confounded by some children receiving p.t. or similar classroom intervention -- No mention of naive diagnosticians

(continued)

Adapted from Olson, M. (1987). Early intervention for children with visual impairments. In M. J. Guralnick & F. C. Bennett (Eds.), The effectiveness of early intervention for at-risk and handicapped children (pp. 318-321). Orlando, FL: Academic Press.

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Table 1.1 (continued)

Summary of Early Intervention Studies Involving Children with Visual Impairments

Reference	Children (age, n)	Intervention Descript.	Experimental Design	Outcome Measures	Conclusions	Weaknesses
Klein, Hasselt, Trefelner, Sandstrom, & Brandt-Snyder (1988)	22 visually impaired and mentally disabled infants/toddlers 0-3 years	Families had 2 hour weekly sessions for 6 month period--sounds like sessions, but unclear monthly "booster" sessions for next 6 months. Goals: (1) enhance social responsibility in children, (2) develop parenting skills and psychological adjustment, (3) collect qualitative interactions and adjustment data.	Single group posttest only.	Qualitative interaction data, observational, self-report.	Preliminary analyses and anecdotal reports from families suggest "utility" of effort. No formal results yet.	-- No comparison group -- No results as yet -- No baseline data -- No mention of naive testers
Montgomery Public Schools (1988)	27 visually impaired children, mean age of 12 months.	Combination of services within a county including home-based, center-based, and Head Start.	Pre/Post comparison. Value-added analysis (change in developmental age in month related to months of intervention)	Battelle Developmental Inventory, Family Satisfaction	Authors stated that short-term program effects could not be determined since numbers were too few.	-- No control group -- Mixture of intervention types
O'Brien (1976)	33 subjects, Birth to 8 years with mild to severe VI.	Home or center-based, parent training for 8 months emphasizing overall development.	Pre-posttest.	Visual Effic. Scale; school health forms, Bolea Pictorial Self-Concept Scale, Boehm Test of Basic Concepts (1971), anecdotal records, instruments developed by researchers.	Program goals were met.	-- No control group. -- No uninformed testers. -- Interventions differed across subjects.
Olson (1983)	15 VI 2-6 year olds.	Home or school intervention for an average of 2.7 years.	Post-only comparison based on initial differences and sighted control group.	Performances rated by teachers of VI children; independent viewing and scoring of 10 categories of behavior.	Intervention created no significant difference between sighted and visually impaired children.	-- Differences in past education confound study. -- No VI control group. -- Interventions differed across subjects.
Rogow (1982)	10 subjects, 1-7 years of age, multi-disabilities.	Home or school intervention for 10 months using graduated prompting strategies.	Pre-post.	Piagetian stages of language development to determine child's functional level of communication via parents, teachers, videotapes.	Intervention increased awareness of social interaction.	-- No non-treatment group. -- Small sample size. -- Very heterogenous group. -- Intervention not consistent across subjects. -- No naive testers.

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As can be seen in Table 1.1, one of the most serious problems with past research is the lack of appropriate comparison groups; the visually impaired subjects were typically compared to either normally sighted peers or a blind comparison group from a previous study. The current study improved upon these research designs by using random assignment of a sample of children with visual impairments to one of two treatment conditions. In addition to lacking appropriate comparison groups, the conclusions of these previous studies are difficult to interpret because very little demographic information is presented about participating subjects (i.e., it is difficult to know whether subjects who come from families with high socioeconomic status respond differently to intervention than subjects who come from families with low socioeconomic status, or whether subjects who are more severely visually impaired respond differently than those who have moderate visual impairments). Because of the extensive demographic data collected as a part of this study, such questions can be examined.

Another point relative to previous research is that exemplary services designed for children with visual impairments have generally been described as needing to be comprehensive in nature, providing systematic instruction to the child as well as providing parents with instructional strategies and support. Unfortunately, most previous studies have not provided clear descriptions of their interventions and have not verified that the intended interventions were actually delivered. The lack of information about the expertise of the intervenors, specific training techniques, curricula, and shaping procedures has made it difficult to understand the comprehensiveness of previous treatments as well as making it difficult for others to replicate the interventions (Guralnick & Bennett, 1987). The collection of treatment verification data by the study, described more fully in a subsequent section, provides specific information about the nature of the interventions used in this research.

As a third point, the majority of previous studies have also failed to measure critical outcomes that may have been affected by the intervention. Using a family-focused approach, the high intensity intervention is sensitive to the effects of the child on the total family, the effects of the family on the child, and the effects of external supports on the child and family. Through the use of measures sensitive to these interactions, this study will provide important assessment data that have been missing from previous studies (see Table 1.1).

All of the studies which reported findings concluded that early intervention resulted in substantial benefits for participating children. However, the methodological weaknesses must be considered when interpreting the results. For example, past studies have been based on very small sample sizes, or single-subject designs. Although such research methods are valuable, further replication is needed to verify the findings. Although the sample size of the study described in this report is relatively small in comparison to most generic early intervention studies, it is larger than studies of children with visual impairments. Additionally, 4 of the 11 studies cited involved subjects with substantial multiple disabilities. More studies are required to investigate the effects of intervention on children who are primarily visually impaired. The study which is described in this report recruited children who were primarily visually impaired with no other severe organic disabilities (e.g., hearing or physical impairments).

Another common methodological weakness of these studies is the absence of diagnosticians who are naive to the research. This has been well documented in the literature as one of the most serious methodological weaknesses, resulting in potentially biased results.

Longitudinal data are also needed to determine whether effective early intervention programs continue to have a noticeable effect on children as they get older (Warren, 1984). Though five of the eight previously cited studies with children with visual impairments had interventions that were at least eight months in duration, none of them provided information regarding long-term effects of the treatment. Since this study includes outcome data for several years following the treatment, it provides some needed information concerning long-term treatment results.

Finally, this study provides an economic perspective on early intervention. One would expect the intensive program to be much more expensive. Therefore, it is important to find out whether the additional costs are justified in terms of the gains made by children or the effects on the family. Furthermore, it is important to find out whether a less expensive program such as the low intensity parent group meetings may result in some benefits (e.g., positive effects on family functioning) that may not be present in the more expensive program which focuses more directly on child progress. Unfortunately, very little attention has been given to cost analysis issues in previous early intervention research, particularly with children with visual impairments.

Methods

Services for children in both groups were funded by the Louisiana Office of Education. The service program was developed by a certified teacher of the visually impaired with extensive experience in service provision and research. Staff who provided direct services included special educators, a social worker, and consulting service providers who were therapists at the Human Development Center at Louisiana State University Medical Center. The program was developed for the research project and provided services to children with visual impairments and their families who otherwise would not have received services. Assistance in the identification of potential research subjects, as well as information regarding various aspects of the subject's vision (i.e., acuity, perception, and discrimination), was provided by the Louisiana State University (LSU) Eye Center.

The geographical area served included the area within a 60-mile radius of New Orleans. Other services available at that time in this area for 0- to 3-year-old children with visual impairments were limited to programs designed to serve children with developmental delays or those that provided private motor and/or speech/language therapy. Consequently, most 0- to 3-year-old children with visual impairments in this area have typically not received any services until they were 3 years old.

Subjects

A total of 35 children between the ages of 0 to 30 months were identified and randomly assigned to groups as of July 1, 1990. The following section describes the recruitment and random assignment procedures for the study. Demographic characteristics of children and families in each group are also summarized.

Recruitment. Subjects were identified through referrals from the LSU Eye Center and from pediatricians and ophthalmologists in the New Orleans area. Children who were identified as potential subjects were screened by either the site liaison or a teacher and therapist. Each child was classified according to visual acuity, presence of other disabilities, and developmental level as follows.

Visual acuity:	1 = blind ($\leq$ 20/2400) 2 = severely impaired with correction ($\leq$ 20/900) 3 = mildly or moderately impaired ($\leq$ 20/200)
Handicapping condition:	1 = no other handicapping condition 2 = presence of one or two other mild handicaps 3 = more than two other mild or severe handicaps
Developmental level:	1 = no more than a 33% delay in motor or socio-communication/cognitive areas 2 = more than 33% delay in either motor or socio-communication/cognitive areas 3 = more than 33% delay in both motor and socio-communication/cognitive areas

The presence of an additional disability was determined by the clinical judgment of qualified motor therapist and/or communication disorders specialist. Developmental level was obtained through the use of a screening instrument that consisted of selected items from the Early Intervention Developmental Profile (Brown et al., 1981). Children were eligible for inclusion in the study if the vision impairment was the major disability and the delays were due primarily to their vision impairment. Children who had more than two other disabilities and who had more than a 33% delay in both motor and socio-communication/cognitive areas were not eligible for enrollment in the study.

As seen in Table 1.2, approximately 2/3 of the subjects had mild vision impairments (between 20/200 and 20/900), with the remaining 1/3 distributed in moderately and severely visually impaired groups. The majority of subjects for both groups were rated as having no additional disability and/or significant developmental delay.

Table 1.2

New Orleans VI Intensity Study Subjects' Degree of Vision and Severity of Handicaps

	Low Intensity	High Intensity
Severe Vision Impairment $\leq$ 20/2400	17%	22%
Moderate Vision Impairment $\leq$ 20/900	11%	11%
Mild Vision Impairment $\leq$ 20/200	72%	67%
Handicapping Condition/Developmental Delay:		
No additional handicap/ developmental delay	67%	56%
1-2 mild-moderate handicap/ developmental delay	33%	44%

The most frequently-occurring causes of vision impairment for subjects were optic atrophy (10%), retinopathy of prematurity (31%), and albinism (17%); other etiologies were present in smaller numbers.

Assignment to groups. After receiving a signed informed consent form from parents, children were randomly assigned to groups stratified by visual acuity, and a combined score for disability and developmental level. (Refer to the EIEI 1986-

1987 report for a more detailed description of the assignment procedures). An initial group of 15 children identified during screenings in the first two weeks of February were rank-ordered by age within the cells. A random assignment pattern was determined for each cell by a computer-simulated four-sided die. Children were assigned based on this pattern within cells. Children who were identified after that date were placed in the appropriate cell and assigned according to the assignment pattern.

Demographic characteristics. Demographic pretest data on all subjects enrolled as of July 1, 1990, are reported in Table 1.3. The population from which children were drawn was about 80% Caucasian and had a high degree of variability with respect to socioeconomic status. Although not statistically significant, there were some differences between groups (e.g., hours per week the mother is employed, with mothers in the low intensity group working more hours; and percent of children in daycare, with more children in the high intensity group being in extended care). Some demographic data related to the father are missing due to single parent families with estranged fathers.

Demographic data collected at the time of each reassessment were analyzed to determine if there were any changes between groups over time. Such differences would then be considered as covariates when analyzing the reassessment data.

No significant differences were found between the low- and high-intensity groups for any of the demographic variables analyzed for reassessments 1, 2, and 3. Some overall changes in demographic characteristics of the sample as a whole were noted over a three-year period.

Although years of father's education remained the same, years of mother's education rose for the low intensity group from 13.0 to 13.4 years, and for the high intensity group from 12.9 to 13.7 years. Changes in hours/week spent in employment by father and mother had also increased. With this increase came increases in mean household income, from $25,265 to $31,266 for the low intensity group and from

$25,000 to $34,136 for the high intensity group. Also, the percent of mothers and fathers employed in positions categorized as technical/managerial or above had increased. Mothers in this category increased from 35% to 50% for the low intensity group and from 11% to 20% in the high intensity group. Fathers in this category increased from 38% to 57% in the low intensity group and from 42.9% to 53% in the high intensity group. While there was a difference (although not significant) between groups for the percent of children in daycare more than five hours/week for reassessment 2 (low intensity = 47%, high intensity = 18%), this difference had minimized by the time of the reassessment 3 testing (low intensity = 42.9%, high intensity = 27.3%). The remaining demographic variables stayed relatively constant over the three-year period.

Subject attrition. Four subjects dropped prior to the collection of Year 1 posttest data; three subjects were dropped from the study based on the parent's decision to no longer participate, and one subject died following prolonged hospitalization. Thus, there were 31 active subjects at Posttest #1. One parent temporarily dropped from participation at Posttest #2, and one subject could not be located; thus, there were 29 active subjects at Posttest 2 time. As of Posttest #3, the formerly lost subject was relocated, though a different family moved without leaving a forwarding address or phone number. Additionally, two families have refused participation due to family strains; however, they may be willing to participate in Posttest #4.

Data for key demographic and pretest variables for those who remained in the study and those who dropped out of the study prior to the collection of Posttest #1 data are reported for children in each group in Table 1.4. As can be seen, those who dropped out from each group are quite similar to those who remained, except for the

Table 1.3

Comparability of Groups on Demographic Characteristics for NO/VI Intensity Study: All Subjects Enrolled by August 1, 1990

	Low Intensity			High Intensity				
	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p Value	ES^
• Age of child in months at pretest	14.5	(10.0)	17	12.3	(11.7)	18	.57	-.22
• Age of mother in years	25.5	(4.3)	17	27.3	(6.5)	17	.36	.42
• Age of father in years	31.4	(8.7)	15	33.3	(10.4)	16	.60	.22
• Percent Male*	41%		17	56%		18	.44	.25
• Years of Education–Mother	13.0	(1.8)	17	12.9	(2.6)	18	.94	-.06
• Years of Education–Father	13.3	(2.9)	14	13.1	(3.1)	17	.88	-.07
• Percent with both parents living at home	71%		17	83%		18	.43	.26
• Percent of children who are Caucasian*	76%		17	83%		18	.66	.15
• Hours per week mother employed	16.9	(18.9)	17	7.8	(15.9)	18	.13	-.48
• Hours per week father employed	40.8	(15.7)	10	39.3	(19.5)	16	.83	-.10
• Percent of mothers employed as technical managerial or above*	35%		17	11%		18	.12	-.50
• Percent of fathers employed as technical managerial or above*	38%		13	53%		15	.49	.25
• Mean total household income+ (median)	\$25,265 \$25,000	(\$17,316)	17 18	\$27,139 \$13,000	(\$27,649)	18 18	.81	.11
• Percent with mother as primary caregiver*	82%		17	89%		18	.64	.15
• Percent of children in day care more than 5 hours per day*	47%		17	18%		17	.09	-.56
• Number of siblings	.7	(.9)	17	.8	(.8)	17	.69	.12
• Percent with English as primary language*	100%		17	100%		18	1.00	0.00

^ Effect Size (ES) is defined here as the difference between the groups (expanded minus basic) on the $\bar{x}$ scores divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size). The positive or negative sign of the ES only indicates direction of difference; no value judgement is intended.

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored at "0."

+ Means and standard deviations for this variable were estimated from categorical data.

income variable. Since so few children have dropped out of the study, the test of statistical significance is not particularly meaningful, even though it is recorded in the table. These data seem to suggest, however, that attrition which has occurred thus far has not substantially effected the results of the study.

Table 1.4

New Orleans VI Intensity Study Attrition Comparison

		Group						ANOVA				
		Low Intensity			High Intensity			Group		Study Status		Group by Status
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ES[*]	p Value	ES[*]	p Value	p Value
CA at Pretest	IN	15.2	(9.8)	16	14.1	(12.5)	13		.62		.12	.47
	OUT	3.5	(.7)	2	9.8	(8.8)	4					
Total PSI	IN	224.4	(35.0)	16	210.4	(21.1)	13	.29	.97	.18	.80	.31
	OUT	213.5	(12.0)	2	228.5	(32.9)	4					
Education Mother	IN	13.1	(1.8)	16	12.8	(2.7)	13	-.09	.92	.29	.52	.70
	OUT	12.0	(0.0)	2	12.5	(1.7)	4					
Education Father	IN	13.4	(3.0)	13	13.1	(3.4)	11	-.14	.53	.48	.49	.67
	OUT	13.0	(1.4)	2	11.5	(1.0)	4					
Income	IN	$24,500	($17,585)	16	$28,885	($27,910)	13	-.01	.58	.55	.37	.33
	OUT	$22,250	($17,324)	2	$ 9,500	($ 4,950)	4					
FRS	IN	131.9	(10.5)	15	111.3	(22.6)	13	-.49	.03	.13	.20	.79
	OUT	140.5	(5.0)	2	124.3	(21.7)	4					
Hours Deycare	IN	3.5	(3.9)	13	1.6	(2.9)	11	-.60	.02	-.56	.06	.12
	OUT	12.0	(17.0)	2	2.5	(5.0)	4					
BDI Total DQ	IN	73.0	(26.2)	16	60.0	(27.3)	13	-.39	.98	.71	.11	.33
	OUT	63.0	(53.0)	2	69.2	(36.0)	4					

[*] Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the x scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

Intervention Programs

The alternative interventions were designed to be weekly individualized home-based intervention versus parent group meetings that were held approximately 12 times per year. A detailed description of the treatments follows.

High intensity weekly individualized treatment. The more intensive intervention for 0- through 30-month-old subjects consisted of home-based parent-infant sessions in which parents or primary caregivers and their children were given a systematic program individualized to meet the needs of the family as well as the child.

A home-based intervention as the high intensity treatment was chosen for use in this study for several reasons. Home-based programs serving young children who are disabled or at-risk are one of the most typical intervention models in the field (Halpern, 1984). Philosophically, there are numerous advantages to a home-based intervention and the involvement of the family. Some of the earliest advocates of home-based intervention, Shearer and Shearer (1976) argued that home-based intervention was good because:

> (1) Learning occurs in the parent and child's natural environment....(2) There is direct and constant access to behavior as it occurs naturally.... (3) It is more likely that learned behavior will generalize and be maintained....(4) There is more opportunity for full family participation in the teaching process....(5) There is access to the full range of behaviors....(6) Training of parents, who already are natural reinforcing agents, will provide them with the skills necessary to deal with the new behaviors when they occur....and (7) Because the home teacher is working on a one-to-one basis with the parents and child, individualization of instructional goals for both is an operational reality. (pp. 336-337)

There are also practical advantages to home based intervention. For rural or low-income families, travel to a center location is often difficult. Additionally, some children have medical needs that make leaving the home difficult (Bailey & Simeonsson, 1988). In spite of these theoretical and practical justifications for home-based intervention, previous research has provided very little evidence about the effectiveness of home-based intervention, particularly for children with visual impairments.

All infants/toddlers in the individualized treatment group were scheduled for an average of 1 hour of intervention services weekly. The activities incorporated daily routines, such as feeding, diapering and changing, as well as familiar toys and household items. In three instances, it was necessary for families to travel to the program center for intervention services. The travel expenses for these families were covered through program funds.

The model of intervention was consistent with the guidelines set forth by P.L. 99-457 for serving the families of children ages birth through 3 years of age. A case manager coordinated the services for the family. The case manager was typically the education specialist, this varied in accordance with the characteristics of the child and family. Individualized Family Service Plans were developed to meet needs of the child and family.

The person with primary caregiving responsibility for the child at the time was the active participant in the session. In instances in which a parent was not the primary caregiver during program intervention sessions, every effort was made to share information with them in telephone contacts and other visits. For example, one child attended a regular preschool, 5 days a week, and the program teacher provided services there. Meetings were held between program staff, preschool staff, and the parent to discuss and plan strategies and exchange information. All parties were pleased with this pattern of service delivery, which appeared to be the most natural setting for this child.

The degree of caregiver involvement in any one session was individualized according to the needs and skills of the caregiver. The role of the intervenor during the sessions may have been assumed almost entirely by the caregiver, with the program teacher guiding and giving feedback. In other instances, the program teacher demonstrated while the caregiver observed. In most sessions, there was a combination of these patterns. New activities were generally first introduced by the program teacher, who then instructed the caregiver in implementing the activity. Parents were involved in implementing stimulation activities, collecting data, and charting behavior in the home between sessions.

In addition to focusing on specific needs of the individual infant/toddlers, the needs of the family in relation to the child were addressed. Treatment reflected the family's needs in regard to interacting with the child, developing their general knowledge of visual impairments, and improving their skills in encouraging their child's development. Needs for assistance or guidance in obtaining community services such as medical or daycare services for their child were also addressed.

The Louisiana Curriculum for Infants with Handicaps, which was developed by the staff of the Human Development Center, formed the basis for development of intervention activities for this program. The activities in the curriculum take into account the total child and the interactive nature of development across domains. The curriculum was augmented with strategies addressing visual impairments.

Activities (lessons) were developed for the domains of gross motor, fine motor, cognition, self-help, social-emotional, and communication. Information with each lesson included: area, goal, rationale, materials, cautions, teaching procedures, teaching notes, and evaluation criteria. A data collection system was used by parents and program staff for charting children's progress. A Curriculum Placement Instrument (CPI) for each domain was used for choosing activities appropriate for the status of child and family. Modifications were made in specific activities in the curriculum, in consultation with the professional staff, to adapt them to the child's needs and as appropriate for the child's vision.

In addition to the observation and modeling provided by the program teacher, parents were provided instructions on how to implement a specific lesson and the type of weekly data to be collected. Often parents requested information on a particular topic related to visual impairment or child development. The home intervenor provided supplemental information from the Reach Out and Teach curriculum (Ferrell, 1986). This is a manual designed to provide parents with information about visual impairments and appropriate general stimulation activities.

During the first year of the study (1987-1988), the education specialist was the primary contact person working closely with the parents or other caregivers to provide the intervention. The education specialist planned sessions and activities, guided interventions, collected data, maintained attendance records and individual child folders, and coordinated consultations and direct services from other professionals. These two education specialists were certified teachers experienced in serving young children with special needs. The speech therapist, occupational therapist, physical therapist and social worker from the Human Development Center at Louisiana State University assisted in meeting needs of the participating infants/ toddlers and their families. All children were seen, initially, by at least one of these specialists in the screening process. Depending upon the impairments of the child and needs of the family, the specialists were called upon for consultation with the program teacher and/or parents, or for provision of direct services. For example, the speech therapist might have assisted the teacher to design a turn-taking routine and the OT and PT might have provided direct services for children with gross and fine motor problems. During the subsequent two years, the role of the social worker was expanded to provide more direct intervention with families. The social worker maintained close contacts with the families, interacting with them 1-2 times per month. In fact, often the social worker was the case manager.

A certified teacher of the visually impaired supervised the home interventions and offered programming suggestions during 1987-1988. Intervenors were certified special education teachers. As noted by Silberman, Corn, and Sowell (1989), most states have deemed it appropriate to deliver services to children with visual disabilities by having generically trained teachers who are supervised by someone who is certified as a teacher of the visually impaired. Indeed, this model is used with the majority of children with visual impairments. The program functioned without a visual impairment specialist on staff during 1989-1991. However, only six children in the high intensity group were receiving intervention during this time, and all but two had received one year of intervention under supervision of the VI specialist.

Low intensity parent group treatment. Families in the low intensity control group were offered services in the form of group meetings which were held approximately 12 times per year for roughly one hour each. During 1987 and the majority of 1988, parent group meetings were conducted about twice monthly for approximately 9 months out of the year. Due to staff and funding changes, meetings in 1988-1989 were rescheduled to be held in two sessions, each session consisting of 6 weekly meetings. Although informal, there was always a specific topic for discussion, with readings assigned and time for questions and answers. Slides and tapes developed for use with Reach Out and Teach had also been used. After an introductory meeting, appropriate professionals attended the meetings to discuss cognitive development, social skills, and temperament. Presentations focused on the effects of visual impairment on these various areas of development with general suggestions for compensation. General stimulation activities were suggested, but no individualized treatment plans or activities were provided.

After each presentation by a professional, parents were given time to ask specific questions and discuss issues of concern to them. These sessions also functioned as a support group, whereby parents with older children who were visually impaired offered support and information to the parents of younger children.

Treatment Verification

The following procedures were used to verify that treatment was implemented as intended.

Collection of attendance data. Parent and child participation in the individual sessions, as well as parent involvement in group meetings, were recorded according to length of session and staff involved. Non-attendance at regularly scheduled sessions was also recorded according to the reason for non-attendance (e.g., child illness, vacation etc.). Attendance data are summarized in Table 1.5 for subjects following one year of intervention.

As can be seen, the amount of intervention received by each group was substantially different. In addition to the differences and number of hours of intervention received, the types of interventions were diverse. In the high-intensity group, each hour of intervention included individualized, specifically focused developmental activity; whereas in the low-intensity group, the hour of intervention consisted of general discussion around issues such as developmental milestones and facilitative strategies. Consequently, The study closely resembles a treatment versus no-treatment comparison.

Table 1.5

Treatment Verification Data for NO/VI Intensity Study: Report of Services Received Between Pretest and Reassessment #1

	Low Intensity			High Intensity			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	SD	n	P Value
• Average length of intervention in months	12.7	(2.0)	17	12.3	(.5)	14	.46
• Total number of hours of parent meetings	3.4	(3.9)	16	---	---	14	.00
• Total number of hours of individual intervention	---	---	16	29.2	(8.8)	13	.00
• Intervenor's rating of parent involvement with intervention (range 0 to 45)	N/A	N/A	N/A	31.8	(6.1)	12	---
• Receipt of additional therapeutic services outside of assigned intervention							
% receiving Speech/Language therapy	6%			29%			.13
% receiving motor therapy	12%			29%			.29
% receiving daycare	53%			21%			.57
% receiving preschool	6%			31%			.13
• Evaluation of intervenors (range 0 to 30)	24.2			26.0			
• Parent satisfaction with services (range 0 to 4)	3.7	(.5)	7	3.7	(.5)	12	.996

Parent involvement in the home. Various strategies were used to measure parent report of time spent working with their child for those in the weekly intervention. However, accurate information was difficult to obtain, primarily due to the naturalistic learning and teaching approach of the program. Since the intervention in the high-intensity group stressed incidental learning activities to be integrated into the parent and child's daily routine, a discrete measure of time was not meaningful. Therefore, in lieu of a parent report of time, the intervenors rated the parents using a 9-item, 5-point Likert-type scale on their ability to integrate program suggestions at home. Examples of behaviors rated include the parent's ability to facilitate communication, encourage child to use functional vision, respond appropriately to child's initiation. The mean score for the high intensity group reflected moderate to good ability of parents to integrate home activities (see Table 1.5). Since parents in the low intensity group were not expected to be involved in incidental teaching with their children, and no instructions were given to them as to how to be involved in such teaching, no measures were taken on this variable for the low intensity group.

Additional services. Given this experimental design, it was important to document any additional services that subjects in either group may have received. There were few, if any, other services available, if parents were able to pay for them, in the study's geographical area designed to specifically treat children who are visually impaired. However, there were other services available for children with developmental delays. Parents could have accessed motor and/or communicative disorders specialists, though this was expensive. The Children's Hospital also provided such therapies to families who were receiving public assistance. Although there were other infant programs, these did not specialize in serving children with visual impairments. Parents were not restricted from obtaining additional services, though it was unlikely that many such services would be obtained given the lack of opportunities.

To collect information about additional services, parents provided information via an interview with the assessment supervisor regarding any services that were obtained outside of the research program between Pretest and Posttest #1. Based on these data, few subjects received a substantial amount of additional therapeutic services (see Table 1.5). Subjects in the high intensity group reported the receipt of significantly more preschool or daycare hours. In many cases, it was difficult to differentiate center-based daycare from a preschool program. If these services are combined, 60% of children in the low intensity group had no daycare/preschool, and 54% of the children in the high intensity group had no daycare/preschool; this makes the two groups highly comparable.

Additional services data were also collected between Reassessments #1 and #2. Many of the subjects turned three years of age after Reassessment #1, and no longer participated in the original birth-to-three intervention to which they were assigned. Additional services data are only relevant for subjects under three years of age for the purpose of determining any contamination of the two interventions in question.

Information on subjects given between Reassessment #1 and Reassessment #2 indicates that subjects in the high intensity group averaged slightly more additional services (see Table 1.6). It is worthwhile to note that the percentage differences represent few subjects. One high intensity subject received speech and language therapy. The differences in the daycare percentage (83% versus 67%) translates to one more high intensity subject. There were three high intensity subjects and one low intensity subject involved in a preschool program. Again, it appears the overall differences between groups receiving additional services is not significant. Any small bias which exists is in favor of the high intensity group.

Parent satisfaction. Given the important role that parents play in receiving services and providing intervention to their children, rating scales were developed to record parent's satisfaction with the services they were receiving based on their group assignments as well as the service provider's impression of the parents' levels

Table 1.6

Treatment Verification Data for LSU/VI Intensity Study: Receipt of Additional Services Outside of Assigned Intervention Between Reassessment #1 and Reassessment #2

Variable	Low Intensity $\bar{x}$	High Intensity $\bar{x}$	p Value
Receipt of additional therapeutic services outside of assigned intervention			
% receiving Speech/Language therapy therapy	0%	17%	.43
% receiving motor therapy	12%	17%	.81
% receiving daycare	25%	33%	.75
% receiving preschool	25%	50%	.42

of knowledge, attendance, and support. Both forms were completed at posttest time. All obtained information was kept confidential. As shown in Table 1.5, parents from both groups report high satisfaction with the intervention in which they participated.

Evaluations of intervenors. To assist in determining the quality of the intervention, ratings and rankings of the interventionists from both groups were conducted internally by program supervisors, as well as externally by the project site coordinator and an independent reviewer. The program supervisors provided information about the quality of the intervention via a 5-point rating scale in the areas of skills, problem solving, work habits, relationships, communication, and attitude. The average score for the intervenors in the high intensity group was 24.2, from a possible total 30 points. There was only one intervenor in the low intensity group, and she received a total score of 26 out of 30. All intervenors were then compared to professionals in similar positions and rated in either the top 10%, top 25%, top 75%, or bottom 25%. Four of the six intervenors in the high intensity intervention were rated in the top 10%, and the remaining two were rated in the top 25% of their peers. These results reflect a quality program as viewed by staff at the Human Development Center.

In addition to these measures of treatment verification, a formal on-site review was conducted in December, 1988, by the site coordinator. Based on observations of home intervention sessions, reviews of records, and interviews with staff, the program was providing the services as required for the study. A detailed report is available for more specific information.

Dr. Kay Alicyn Ferrell, a well-respected authority on serving young children with visual impairments, provided an independent assessment of the program's ability to meet the unique needs of this population. This independent evaluation occurred in October, 1989. Dr. Ferrell rated the program highly in the area of general assessment procedures, supplementing standardized testing with observations of the child in the natural environment. She noted that attention to functional vision assessment and orientation and mobility assessment was lacking. She also suggested that more attention be given to the development of formal lesson plans and data collection, although the intervenor's records did provide good anecdotal information. IFSP development was rated as meeting all the criteria of a high-quality plan, and overall interaction with parents was viewed very positively. Dr. Ferrell stated that she was favorably impressed with the competencies of the staff in early childhood special education.

Dr. Ferrell noted that the intervenors have done an admirable job, and were serving visually impaired infants and their families far better than some agencies with trained specialists. The lack of staff with specialized training in visual impairment was the primary weakness of the intervention. However, Dr. Ferrell stressed that the presence of professionals certified in visual impairment alone does not necessarily equate to an appropriate early intervention program. Expertise in early childhood development and family intervention is of critical importance to an intervention such as this. The evaluation report in its entirety is available for review upon request.

Contextual Variables Which May Have Affected Results

Data were collected to determine the occurrence of other factors beyond the control of the experimenter which could potentially impact outcome. A comparison of the low versus high intensity groups on such factors follows.

Child health data. Parents completed a self-report questionnaire inquiry about their child's health over the past 12-month period. Quantitative information (e.g., the number of days hospitalized, number of ear infections, etc.) was gathered as well as a qualitative rating of the child's overall health compared to others of the same age. As shown in Table 1.7, no statistically significant differences were found in comparing the health of low versus high intensity children at Reassessments #1, #2, #3, or #4. Parents on average consistently rated their child's health as average compared to other children, with few reporting hospitalizations or infections.

Table 1.7

Contextual Variables as Measured by the Family Inventory of Life Events and Changes at Reassessments #1, #2, #3, and #4

	Low Intensity				High Intensity						
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	ANOVA F	p Value	ES
Reassessment #1											
FILE	7.2	(4.5)	55	17	10.1	(9.0)	40	13	.40	.54	-.42
% no hospital	77				69					.67	.15
% no infections	100				100					1.00	.00
General Health*	1.9	(.5)		17	2.0	(.7)		13		.59	.20
Reassessment #2											
FILE	6.8	(3.1)	69	14	10.7	(8.8)	40	12	2.40	.13	-1.26
% no hospital	73				92					.33	.36
% no infections	93				100					.68	.15
General Health*	2.1	(.5)		15	2.3	(.5)		12		.31	.40
Reassessment #3											
% no hospital	92			13	100			9		.24	.48
% no infections	82			13	100			9		.22	.49
General Health*	2.2	(.4)		13	2.2	(.4)		9		.97	-.02
Reassessment #4											
% no hospital	92			12	78			10		.27	-.45
% no infections	83			12	90			10		.50	.27
General Health*	2.2	(.6)		12	2.0	(.7)		10	.40	.54	-.34

*1 = Worse than others, 2 = Same as others, 3 = Better than others

Major life events. As previously mentioned, the Family Inventory of Life Events and Changes (FILE) was administered as a core instrument to measure the occurrence of stressful life events. Although the FILE assesses the occurrence of positive as well as negative life events, both are viewed as causing an increase in stress. Therefore, any differences in the amount of life events between groups may influence the study results. As shown in Table 1.7, no statistically significant differences were found between groups at Reassessment #1 or #2, and both groups received mean scores in the average percentile range. At Reassessment #2, however, the mean score for the high intensity group was slightly higher (although non-significant); this was found to be due to one parent who reported the occurrence of many stressful life events which skewed the means. The FILE was not collected at Reassessments #3 or #4 due to negative comments from some parents regarding its intrusiveness. Based on these analyses, there did not appear to be any measured extraneous factors which warranted consideration in the analysis. Subgroup analysis with these data (e.g., poor versus good health) is planned for the future.

Cost of Alternative Interventions

Program costs were calculated using the ingredients approach. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earnings for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989). As shown in Table 1.8, each alternative used varying amounts of the indicated resources. The following sections describe the resources and costs used for the weekly home visit program and the parent group meetings.

Table 1.8

Cost per Child for NO-VI Site (1990 Dollars)

Resources	High Intensity (n=15)	Low Intensity (n=15)
Agency Resources		
Direct services	$3,942	$ 269
Administration		
program	1,620	175
university	702	60
Occupancy	321	9
Equipment	125	9
Transportation	108	0
Materials/supplies	79	20
Telephone	75	1
Sub Total	$6,272	$ 543
Contributed Resources		
Direct services	0	16
Parent time	234	232
Parent transportation	428	115
Sub Total	$ 662	$ 363
Total	***$6,934***	***$ 906***

* Totals may not add up due to rounding errors.

Analysis of the cost data for the LSU VI project reflects the per child costs for the individualized, weekly home-visit intervention versus the low intensity parent group intervention. These data were collected in June of 1988 and are adjusted for inflation to 1990 dollars. Since there had not been any major changes in the interventions, cost data were not collected each subsequent year.

Cost of high intensity, weekly home-visit intervention. Salaries and benefits for direct service and administrative personnel were determined according to their FTE devoted to this aspect of the project. Direct service personnel included two teachers, an occupational therapist, a speech therapist, a physical therapist, a social worker, a developmental pediatrician, and a temporary home-based teacher hired for three months on a consulting basis. Administrative personnel included the program director, the principal, and a secretary. University administration was calculated using the LSU indirect rate of 12.6% for general, departmental, and sponsored projects administration. Parent time was required for participation in home visits, special sessions with the therapists, and for programming assessments. The opportunity cost of parent time ($9/hour) was applied to the average time (23.2 hours) each parent spent in the home-based visits during 1987-88. However, the actual value of parent contributions is probably much higher in this program than it appears since the majority of parent contribution was involved via incidental teaching strategies that are difficult to measure quantitatively. Thus, the actual estimation of value of parent time is most likely an underestimate of what the parents actually contributed.

Occupancy charges, including space, maintenance, utilities, and insurance costs, are based on office leasing costs in the area. Nine dollars per square foot was applied to the 478 square feet used by the program (also pro-rated according to FTE). Annual equipment cost was determined by taking inventory of all instructional materials, office furniture, and equipment. Market replacement values were then applied to each item, costs were annualized accounting for interest and depreciation, and pro-rated according to the percent FTE worked on the project. Staff travel was based on actual mileage (at $.21 per mile) for home visits. Several parents were reimbursed for travel to the center for weekly intervention services. For parents who were not reimbursed, information was collected via telephone interview on the number of trips made to the center, the round-trip distance, and the approximate time spent in travel. Parent transportation costs were then calculated based on $.21 per mile and the opportunity cost of parent time ($9/hour) spent in travel. The cost of materials, supplies, and telephone charges were assessed based on actual usage of these items.

Cost of low intensity, parent group meetings. Direct service costs for the low intensity parent group meetings involved compensation for the group leader on a contractual basis. Various professionals assisted the group leader in addressing specific topics on a volunteer basis. The opportunity cost of their time was determined at $25 per hour for 9 hours. Program administrative cost included a small portion of the site liaison's FTE. University administrative cost was based on the indirect rate as explained above. Parent costs included time spent in the group meetings (based on average attendance), as well as time and expenses associated with travel to the meetings (parent travel information was obtained for this group also by telephone interview). Occupancy cost, calculated at $9 per square foot, (for 47 square feet, pro-rated according to usage by the program) was calculated for the group meeting room at the LSU Eye Center and the site liaison's office. Equipment costs for the group meetings include instructional/curricular materials (Reach Out and Teach) and office equipment and furniture which was valued, annualized, and pro-rated according to FTE. Finally, telephone and materials and supplies costs were assessed based on annual actual usage.

Data Collection

Data on children and their families were collected using instruments selected to yield descriptive information (i.e., demographics) as well as assess treatment effects. A description of diagnostician requirements is described below, followed by descriptions of the pretest and reassessment instruments for this study (refer to Tables 1.9 and 1.10 for summary and descriptions of measures).

Recruitment, training, and monitoring of diagnosticians. All testers recruited for the study successfully completed the certification process required for administration of the Battelle Developmental Inventory. The training involved approximately 4 hours of independent study, 8 hours of group training, and a minimum of 3 practice administrations with 85% interrater agreement required. From the beginning of the study in 1987, through 1989, testers were recruited through the Human Development Center (HDC) at Louisiana State University. As of January, 1990, testers were recruited from the Special Education Department at the University of New

Orleans. All of the diagnosticians had bachelor's or master's degrees and extensive experience assessing infants and children with disabilities, including visual impairments. All the testers were naive to the subject assignment. Shadowscoring was conducted on 10% of the BDI administrations, averaging 93% interrater agreement. Assessment supervisors were recruited from the New Orleans area to coordinate the schedule of the testing, review the data for completeness, and conduct tester reliability checks. Assessment supervisors have had a masters or a Ph.D. with expertise in diagnostic evaluation.

Pretest. After children were identified and assigned to groups based on their visual acuity and screening results, a pretest battery consisting of the Battelle Developmental Inventory (BDI), Parenting Stress Inventory (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III), were administered. (Specific psychometric information regarding these measures can be found in the EIEI 1986-87 annual report.) Demographic information was also obtained via interview with the parent. These measures were considered as potential covariates in the Reassessment analyses and were used to investigate whether certain types of families or certain types of children benefit more from intervention.

The BDI was administered by a trained diagnostician who was unaware of the child's group assignment. Testing occurred at the Human Development Center in New Orleans, ensuring that the testing setting was the same for all subjects.

The family measures were completed by the parent attending the testing session following the administration of the BDI. Married parents and those with spouse equivalents were also given a copy of the FSS to take home for their partner to complete. To encourage and reinforce parent participation in the assessment process, parents were paid a monetary incentive of $20 for completing the pretest battery. The diagnostician scored the BDI and completed a testing report. The diagnostician did not score the family measures. All data were then transmitted to the assessment

Table 1.9

Schedule of Administration and Tests Administered for New Orleans Visual Impairment Study

	Pretest	Reassessment #1	Reassessment #2	Reassessment #3	Reassessment #4	Reassessment #5
CHILD MEASURES						
Battelle Developmental Inventory	X	X	X	X	X	X (motor)
Play Assessment Scale Videotaped Scenario of Exploration/Play			X			
Early Intervention Developmental Profile		X				
Vineland Adaptive Behavior Scales				X	X	X
Carolina Record of Individual Behavior		X				
Boehm Test of Basic Concepts					X	X
Test of Language Development, Primary, 2nd Ed.						X
McCarthy Scales of Children's Abilities						X
Social Skill Rating System					X	X
Forced-Choice Preferential Looking Technique						
Parent Self-Awareness Scale						X
FAMILY MEASURES						
Parenting Stress Index	X	X	X	X	X	X
Family Support Scale	X	X	X	X	X	X
Family Resource Scale	X	X	X	X	X	X
Family Inventory of Life Events and Changes	X	X	X			
Family Adaptation and Cohesion Scales	X	X	X	X	X	
Videotaped Scenario of Parent/Child Interaction		X	X	X		
Holmes-Rahe Schedule of Recent Events						X

Table 1.10

Description of Tests Administered for New Orleans Visual Impairment Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
The Boehm Test of Basic Concepts--Form A (Boehm, 1971) The Tactile Analog (Caton, 1976)	This instrument is designed to measure children's mastery of concepts considered necessary in kindergarten through second grade. The BTBC consists of a series of 50 picture items and could easily be used with many low vision children. The TTBC is composed of 50 plastic sheets on which 50 items of the BTBC are presented in raised outline drawings. Internal consistency and content validity are reported to be sound.
The Vineland Adaptive Behavior Scales--Survey Edition (Sparrow, Balla, and Cicchetti (1984)	This version provides a general assessment of adaptive behavior, covering the domains of communication, daily living skills, socialization, and motor skills. It is administered to a parent or caregiver in a semistructured interview format. It is appropriate for use with persons ages birth to adult. Standard scores and age equivalents are obtainable. Norms for special populations (i.e., visually impaired) are also provided. Interrater reliabilities, internal consistencies, and concurrent validity data strongly support its use.
Videotaped Scenario of Exploration/Play (E.I.R.I.)	A standard protocol was developed by EIRI to assess exploration and independent play behaviors in children with visual impairments. Based on a review of the literature, standard toys were selected. The protocol lends itself to use with various systems (i.e., Fewell, Belsky). This assessment provides information on the child's use of senses and an estimate of cognitive development in a nonthreatening, child-directed manner. Play Assessment Scale (Fewell, 86).
Forced-Choice Preferential Looking Technique	This is a newly-developed acuity test for young children 1 to 36 months, developmentally. It has been proven useful with difficult-to-test children, and those who are unresponsive to traditional acuity measures. During the testing, the child is shown a stimulus display containing a black-and-white grating on one side and a homogenous gray target on the other. Acuity is determined according to the stripe width to which the child fixates. It has been shown to successfully estimate acuity in 95% of study sample.
The Carolina Record of Individual Behavior (Simeonsson, 1981)	This instrument is a rating of variables related to the child's interaction with the environment, a key focus of the high intensity intervention. Ratings are based on the diagnostician's clinical impressions when administering the EIDP. Sound test-retest reliabilities are reported as well as some degree of construct validity.
The Early Intervention Developmental Profile (Brown et al., 1981)	This is a criterion and age-referenced instrument that assesses all major areas of development with an emphasis on sensorimotor intellectual markers. It has 299 items broken down into small age ranges. The manual reports strong concurrent validity with other standardized measures as well as strong interrater and test-retest reliabilities.
Videotaped Scenario of Parent-Child Interaction	A standardized protocol was developed by EIRI which would lend itself to various methods of evading parent-child interaction. A 20-minute routine included free play and a structured activity (storytelling), as well as parent-child separation and reunion.
McCarthy Scales of Children's Abilities	A test designed to determine the intellectual development of children. Only the verbal scale was administered because it does not rely on visual stimulation.
Test of Language Development Primary--II	A test designed to identify language skills used by children and how they compare to their peers. This test helps identify any problems in language proficiency; determining specific strengths and weaknesses in language skills; to keep track of progress the children make.
Social Skills Rating System	This parent survey was used to assess social skills used in the home and community. It is based on parent self-report.

(continued)

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Table 1.10 (continued)

Description of Tests Administered for New Orleans Visual Impairment Study

MEASURES	DESCRIPTION
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors.
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Parent Self-Awareness Scale	A self-report measure containing 43 events associated with stress requiring the respondent to mark those events which occurred within the past year. A total life stress score, as well as a score for negative events, are calculated.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
Assessment of Mother/Child Interaction	Assesses the quantity and quality of maternal interaction behaviors. A videotaped standardized protocol is followed, which is then assessed using multiple rating systems.

supervisor. The assessment supervisor maintained copies of all of the protocols for the on-site records and submitted the original protocols via certified mail to the EIRI site coordinator who supervised checking of the accuracy and completeness of the protocols, scoring of the family measures, and entering the data into the computer.

Reassessment #1. Reassessment measures were collected after children were in the program for 12 months. These included the Battelle Developmental Inventory and the family measures previously described. In addition, the Early Intervention Developmental Profile (EIDP) (Brown, et al., 1981) the Carolina Record of Individual Behavior (CRIB) (Simeonsson, 1981), Assessment of Preferential Looking, and videotaped assessment of parent-child interaction were collected one year from the date of pretest. Parents were again paid to compensate them for their efforts (refer to Table 1.10 for a description of these measures).

The EIDP was administered in conjunction with the BDI, with identical items being scored based on the child's BDI performance and unique items being administered following the BDI administration. A separate diagnostician, also naive to subject assignment, administered the EIDP. The Carolina Record of Individual Behavior (CRIB) was completed on each child based on the BDI diagnostician's clinical impressions when administering the EIDP.

Forced Preferential Looking (Teller, Morse, Boston, & Regal, 1974) was conducted at both pre- and Reassessment time through the LSU Eye Center. The pretest preferential looking test was used to stratify according to acuity for group assignment. Preferential looking was also conducted as a Reassessment measure in order to monitor any changes in vision which may impact test results. As the children grew older, traditional acuity tests (e.g., Lighthouse cards) were used.

Videotaped assessment of parent-child interaction was used to measure the effects of intervention on parent-child relationships. This was considered to be an important outcome given the dramatic differences in the two treatments being compared. This information can potentially provide further insight into the effects of a visual impairment on parent-child relationships.

Three coding systems were piloted to code the tapes, each using a slightly different approach to analysis. The Parent/Caregiver Involvement Scale (Farran, Kasari, Comfort, & Jay, 1986), rates maternal behavioral descriptors on a 5-point scale across three dimensions: amount, quality, and appropriateness. Global ratings of (1) availability of parent to child, (2) general acceptance and approval manifested by parent, (3) general atmosphere, (4) enjoyment, and (5) provision of learning environment. All of the Reassessment #1 tapes have been coded using this system. The Parent-Child Behavioral Observation System (Marfo, 1989) examines behavior as a dynamic process, measuring both child and parent behaviors and how they interact. Eighty percent of the tapes have been coded by Marfo. The Parental Behavior Rating Scale (Mahoney, 1988) rates 12 parental behaviors (warmth, expressiveness, enjoyment, acceptance, sensitivity to child's interest, responsivity, effectiveness, directiveness, achievement, orientation, paces, inventiveness, and verbal praise) which are divided into three factors of (1) affective relationship with child, (2) orientation responsivity to child, and (3) performance orientation. Ratings are based on a 5-point Likert-type scale.

These measures provide information which is useful in establishing the comparability of the two intervention groups as well as providing information to investigate whether certain types of families or children benefit more from the intervention procedures.

Reassessment #2. The measures administered two years from the date of pretest (Reassessment #2) include the BDI and the previously described family measures. Complementary measures include the assessment of preferential looking and two videotaped assessment procedures. One of these was the previously-described videotaped assessment of parent-child interaction. In addition to assessing group differences, this measure was repeated with the intention of providing insight into the impact of a visual impairment on later parent-child interactions.

The other videotaped assessment was a standardized procedure for assessing exploration and play. Both exploration (the skills used to obtain information about novelties in the environment) and play (involving the application of information obtained through exploration) are outcome measures that are not assessed through traditional assessments, and yet are behaviors that have been closely related to cognition, language, and social development. Learning through exploration and play were strategies emphasized by the high-intensity, weekly intervention program. The Play Assessment Scale (Fewell, 1986) was used to analyze the exploration/free play videotaped scenarios.

By the time of Reassessment 2, many families had relocated out of the original catchment area, making it difficult for families to come to a central testing area. For this reason, the location of some families necessitated testing in their homes. However, testers made every effort to ensure that there was a structured atmosphere similar to that of the center-based testing atmosphere. It is also worth noting that parents reported preferring the home setting due to their children feeling more comfortable with the familiar environment.

Reassessment #3. The reassessment measures used three years after pretest serve to measure the long-term effects of the intervention. These measures include the BDI and the previously described family measures with the exclusion of the Family Inventory Life Events and Change (FILE). Additionally, the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984) were selected to obtain a more detailed estimate of the child's ability to function independently. The items on the Vineland tend to be less vision-oriented; in fact, norms for children with visual impairments are provided. Educational placement and support services were documented to determine any differences in degree of special services due to the group assignment. Also (according to Table 1.9), a videotaped scenario of parent/child interaction (as previously described) was given.

Reassessment #4. The reassessment measures used at four years from pretest include the BDI as well as the Vineland Adaptive Behavior Scales. In addition, the Boehm Test of Basic Concepts (Boehm, 1971) was used to assess concepts requisite for school success. The Boehm stimulus materials lend themselves to enlargement for low vision children; there is also a tactile analogue to the Boehm which is appropriate for totally blind children. The Social Skills Rating System (Gresham & Elliott, 1990) was used to assess the social and school survival skills of the child; both the teacher- and parent-report versions were used. The Parenting Stress Index, the Family Resource Scale, the Family Support Scale, and the Family Adaptability and Cohesion Evaluation Scales III are also part of the Reassessment #4 battery.

Reassessment #5. The Vineland Adaptive Behavior Scales, the Social Skills Rating System, and the motor domain of the BDI were administered. Since the majority of the children functioned above the developmental limits of the other BDI domains, portions of the McCarthy Scales of Children's Abilities and the Test of Language Development--Primary, second edition were used to obtain an estimate of cognition and language development. Only those subscales which did not require vision were used. The Parenting Stress Index--Short Form, the Family Resource Scale, and the Family Support Scale continued to be used as family functioning measures. The Parent Self-Awareness Scale (Snyder, Weeldreyer, Dunst, & Cooper, 1986) was selected to consider the parent's sense of empowerment in dealing with the child's educational/ intervention needs. The Scale of Recent Events (Holmes & Rahe, 1967) was used to identify the occurrence of life events which could impact family functioning. Reassessment #5 data have been collected on roughly half of the subjects due to staggered enrollment; these results will be available by October, 1993.

Results and Discussion

The following section presents results of the study with respect to comparability of the groups on pretest measures, and the findings regarding the effects of alternative forms of intervention on measures of child and family functioning. To date, the results only pertain to the findings based on Reassessments 1 through 4.

Comparability of Groups on Pretest Measures

Table 1.11 presents comparability of groups for all active subjects. (Scores for the FILE were reported here for the sake of showing comparability at pretest time. However, it was not viewed as an outcome measure.) BDI gross motor and motor total pretest scores are statistically significantly higher for the low intensity group (p = .06 and .10, respectively). In comparing the scores on the family

Table 1.11

Comparability of Groups on Pretest Measures for NO/VI Intensity Study

	Low Intensity				High Intensity					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES[^]
• Age in months at pretest	14.5	(10.0)		17	13.1	(12.5)		14	.75	-.14
• **Battelle Developmental Inventory (BDI)**[+]										
Personal Social	39.3	(22.2)		17	32.7	(24.1)		14	.44	-.30
Adaptive Behavior	29.5	(18.5)		17	22.8	(17.2)		14	.31	-.36
Gross Motor	30.5	(18.8)		17	18.3	(14.4)		14	.06	-.65
Fine Motor	13.7	(9.8)		17	10.0	(9.1)		14	.29	-.38
Motor Total	44.2	(27.9)		17	28.3	(23.3)		14	.10	-.57
Communication	24.0	(14.9)		17	18.5	(15.9)		14	.33	-.37
Cognitive	16.1	(11.8)		17	11.4	(8.9)		14	.23	-.40
TOTAL	153.1	(92.9)		17	113.6	(87.3)		14	.24	-.43
• **Parenting Stress Index (PSI) Percentile Rank**[@#]										
Child Related (range 47 to 235)	102.4	(22.5)	60	17	100.6	(16.6)	57	14	.81	+.08
Other Related (range 54 to 270)	120.9	(17.5)	50	17	114.9	(17.8)	40	14	.36	+.34
TOTAL (range 101 to 505)	223.3	(34.2)	53	17	216.1	(29.4)	43	14	.54	+.21
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**										
Adaptation	23.8	(6.0)		17	23.3	(5.6)		14	.82	-.08
Cohesion	39.9	(5.7)		17	40.1	(6.5)		14	.95	.04
• **Family Resource Scale (FRS)**[&%]	131.6	(10.2)	74	17	117.3	(18.4)	48	14	.02	-1.40
• **Family Index of Life Events (FILE)**[$#]	7.9	(5.3)	55	17	10.4	(5.9)	40	14	.24	-.47
• **Family Support Scale (FSS)**[&%]	28.3	(11.5)	52	17	28.6	(10.4)	53	14	.93	-.03

[^] Effect Size (ES) is defined here as difference between groups (high intensity minus low intensity) on $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[+] Statistical analyses for BDI scores were conducted using raw scores for each of the scales.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[#] Statistical analysis and effect size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ES are most desirable.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with children with disabilities).

[$] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

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measures between groups, the mean FRS score was significantly lower (p = .02) for the high intensity families; therefore, the FRS was considered as a covariate in the analyses of Reassessment data.

Given the differences in BDI gross motor and FRS scores among the low versus high intensity group, these variables were used as covariates in the Reassessment analyses.

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Data are presented for children who were tested after one year of intervention, followed by data on children who were reassessed two, three, and four years from the date of pretest. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $p \leq .10$, and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977) in those cases where a covariate or set of covariates could be found which correlated with the dependent variable in question (which was almost the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 87% for finding moderate sized differences (defined by Cohen as differences of a half a standard deviation) when analyzing child outcome variables.

Results of Reassessment #1. Table 1.12 summarizes the reassessment data for both low and high intensity subjects who have received the prescribed intervention for one year. Analyses of covariance were conducted for the BDI raw scores using the gross motor raw score and the Family Resource Scales, as these variables were different for the two treatment groups at pretest time and were highly correlated with outcome variables. Chronological age at pretest was also used as a covariate due to the high degree of variability and its correlation with the outcome measures.

Analysis of the BDI Reassessment data show that the adjusted means for BDI for gross motor scores were statistically significantly different in favor of the low intensity group ($p = .02$). Adaptive, fine motor, communication, and cognitive domains, as well as BDI total scores, were higher, but not statistically significant (at the $p \le .10$ level) for the high intensity group. Scores for the Early Intervention Developmental Profile, a criterion-referenced measure, are also reported in Table 1.12, using the Battelle gross motor raw score, the FRS, and chronological age at pretest as covariates. The low intensity group generally scored higher on all domains, except for self care with the gross motor subdomain reflecting statistical significance. The average effect size for these two developmental measures was -.05.

Scores for the Carolina Record of Individual Behavior are reported for selected domains based on the ability to provide unique information as well as those most pertinent to the study. Scores for social orientation (reflects the child's responsiveness to persons in the environment), participation (describes the child's participation with the examiner), attention span (degree of persistence in attending to object, person, or activity), responsiveness to caretaker (degree of contact through eye contact, vocalizations, and/or touch), and negative affect (crying, avoidance, clinging) revealed no significant differences between groups. The high intensity group scored significantly better ($p \le .05$) in the areas of exploration of objects using the senses (i.e., tactile via hands and mouth, olfactory) and reactivity (the ease with which the child is stimulated). The score for positive

Table 1.12

Reassessment #1 Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	ES[^]
• Average length of intervention in months		12.7	(2.0)		17	12.3	(.5)		14	.46	-.20	
• Age in months at Reassessment		27.9	(9.9)		17	26.1	(13.4)		14	.67	-.18	
• **Battelle Developmental Inventory (BDI)**[*]	1,2,3											
Personal-Social		80.4	(30.7)	71.3	17	62.6	(27.9)	71.8	14	.00	.94	+.02
Adaptive Behavior		51.3	(15.2)	46.5	17	44.0	(16.0)	48.8	14	.35	.56	+.15
Fine Motor		26.9	(11.4)	23.9	17	21.1	(9.0)	24.1	14	.00	.95	+.02
Gross Motor		48.8	(10.9)	45.5	17	35.2	(11.7)	38.5	14	5.8	.02	-.64
Communication		42.6	(17.5)	36.7	17	34.5	(14.5)	39.5	14	.19	.67	+.16
Cognitive		30.0	(13.9)	26.2	17	25.4	(13.9)	29.2	14	.54	.47	+.22
TOTAL		279.9	(94.6)	251.0	17	222.9	(89.0)	251.8	14	.00	.97	.00
• **EIDP**[+]	1,2,3											
Gross Motor		69.6	(18.0)	65.0	17	53.8	(13.3)	58.4	14	3.18	.09	-.37
Fine Motor		36.4	(18.1)	32.5	17	27.8	(12.2)	31.7	14	.03	.86	-.04
Self-Care		38.8	(13.7)	34.9	17	32.8	(12.0)	36.7	13	.34	.57	+.13
Cognitive		37.2	(16.6)	33.0	17	25.8	(11.0)	30.0	14	.61	.44	-.18
Social		37.6	(13.2)	33.5	16	29.5	(11.5)	33.6	14	.00	.98	.00
Language		40.2	(15.6)	34.6	16	26.7	(14.0)	32.3	14	.63	.44	-.15
											$\bar{x}$ ES =	-.05
• **CRIB**	1,2,3											
Social Orientation[&] (range 0-9)		8.1	(1.3)	7.8	17	7.6	(1.6)	7.9	14	.03	.86	+.08
Participation[&] (range 0-9)		6.4	(2.0)	6.0	17	6.1	(2.1)	6.5	14	.32	.58	+.25
Reactivity[@] (range 0-5)		5.3	(.9)	5.5	17	4.9	(.8)	4.7	14	5.2	.03	+.94
Attention[@] (range 0-5)		5.6	(1.0)	5.6	17	5.7	(1.1)	5.8	14	.26	.62	-.20
Responsiveness[@] (range 0-5)		5.1	(.4)	5.0	17	5.1	(.7)	5.1	14	.23	.63	-.23
Negative Affect[@] (range 0-16)		4.4	(3.3)	4.5	17	4.4	(3.9)	4.4	14	.01	.93	+.03
Positive Affect[&] (range 0-8)		4.4	(2.0)	4.3	17	2.7	(1.1)	2.8	14	4.9	.04	-.75
Exploration[&] (range 0-12)		1.3	(.5)	1.3	17	1.8	(.8)	1.8	14	4.34	.05	+.94
											$\bar{x}$ ES =	+.13

[^] Effect size (ES) is defined here as the difference between the groups (high minus low) on the $\bar{x}$ scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[*] Statistical analysis for BDI scores was based on raw score data.

[+] Analyses for the Early Intervention Developmental Profile are based on raw scores for the number of correct responses.

[&] Scores are based on a 9-point range with 1 as the most basic level and 9 the most advanced; therefore, high scores are best.

[@] Scores are based on the "ideal" score reported in the manual. A score of "0" is best, and positive ESs indicate that the high intensity intervention group scored better.

[$] Covariates: 1 = BDI Gross Motor Raw; 2 = Family Resource Scale Raw; 3 = Chronological Age at Pretest

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affect (laughing/smiling) was statistically significant (p = .04) in favor of the low intensity group. The mean effect size for the CRIB subscales was +.13.

Subgroup analysis. A subgroup analysis was performed on Reassessment #1 data applying a two-way analysis of variance by intervention group and by severity of vision loss (acuity worse than 20/800 versus acuity better than 20/800), using Battelle raw scores as dependent variables. No statistically significant interactions were found between intervention and degree of vision loss. However, as would be expected, Battelle scores were influenced by degree of vision loss alone, with children whose acuity was worse than 20/800 receiving lower scores.

The effects of socioeconomic status on degree of child progress was also analyzed, applying a two-way analysis of variance by intervention and by income [income greater than $13,000 (the median income) versus income less than $13,000]. Results reflect a trend toward the high intensity group having a greater impact on BDI scores for families with incomes more than $13,000 compared to families of income less than $13,000; however, only one of the five domains (adaptive) reached a level of significance ($p \leq .03$).

Results of Reassessment #2. Data were obtained on 28 of the 31 active subjects. As mentioned in the treatment verification section, the degree of intervention has varied for subjects between Year 1 and Year 2 posttesting. Of the 13 subjects assigned to the high intensity intervention, 7 subjects continued to receive the prescribed intervention and 6 graduated from the program upon reaching 3 years of age. Of the 15 children assigned to the low intensity intervention, 8 continued to participate in the original assigned intervention, although their attendance at the group meetings was negligible. Seven children graduated from the program upon reaching three years of age. A summary of the educational services obtained for those children over 3 years of age is presented in Table 1.13. As portrayed in the table, both groups have been receiving a wide range of services. However, this appears to be balanced across groups.

Table 1.13
Summary of Educational Services at Reassessment #2 for Subjects Who Graduated from Original Assigned Intervention in the New Orleans VI Study

	Low Intensity (n = 7)	High Intensity (n = 8)
Regular Preschool/No Special Services	4	3
Integrated Special Education Services	3	4
Self-Contained Special Education Services	2	1
Other	3	1

Given the various types of interventions present within the low and high intensity intervention groups due to the exiting of subjects from the original intervention upon reaching age 3 years, it is difficult to draw a conclusion regarding two years of consistent intervention. Rather, the data in Table 1.14 reflect the long-term effects of one year of the prescribed interventions.

Table 1.14

Reassessment #2 Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates[a]	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	P Value	ES[^]
• **Average time between Pretest and Reassessment #2**		26.8	(2.1)		15	28.5	(3.8)		13	3.20	.15	.80
• **Age in months at Reassessment**		42.3	(9.4)		15	42.2	(12.3)		13	1.70	1.00	-.01
• **Battelle Developmental[*] Inventory F (BDI)**												
Personal/Social	1,2	120.1	(26.2)	112.8	15	102.4	(35.5)	109.6	13	.09	.77	-.12
Adaptive Behavior	1,2	74.5	(17.7)	69.6	15	63.1	(20.7)	68.0	13	.05	.82	-.09
Motor Total	1,2	99.1	(18.3)	94.4	15	80.3	(21.2)	85.0	13	1.90	.18	-.51
Communication	1,2	64.3	(18.3)	57.6	15	52.9	(25.1)	59.6	13	.08	.78	.11
Cognitive	1,2	49.2	(21.5)	42.4	15	38.6	(22.7)	45.4	13	.18	.68	.14
TOTAL	1,2	407.2	(93.3)	376.9	15	337.3	(116.3)	367.7	13	.08	.79	-.10
• **Exploration/Play Developmental Age (In Months)**	1,2	18.5	(4.5)	17.6	13	16.0	(6.8)	17.0	11	.04	.84	-.13
												$\bar{X}$ ES = -.15

[^] Effect size (ES) is defined here as the difference between the groups (High minus low) on the $\bar{X}$ scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[*] Statistical analysis for BDI scores were conducted using raw scores.

[a] Covariates: 1 = Family Resource Scale; 2 = BDI Gross Motor Raw

Battelle pretest gross motor raw scores and FRS pretest scores were used as covariates. In reviewing the BDI domain scores for Reassessment #2, the mean domain and total scores were not significantly different, reflecting overall negligible effect sizes.

The developmental play ages of children based on the videotapes of spontaneous, independent play are also reported in Table 1.14. Adjusted mean scores for the two groups revealed no significant differences, with a negligible effect size.

Subgroup analysis. As previously mentioned, subjects were enrolled in the study provided that they were under 30 months of age. Therefore, children who were enrolled as infants received two years of either the low or high intensity intervention. Children who were between two and three years of age at enrollment received one year of the assigned intervention and then graduated from the program. To determine whether duration of intervention was related to outcomes, a subgroup analysis was performed by dividing the high and low intensity groups into those who received two years of the designed intervention and those who received only one year of the intervention. These results are presented in Table 1.15. The subgroup analysis resulted in no statistically significant interaction effect between duration of intervention and intensity on BDI scores. Those who received two years of high intensity intervention did not score significantly better than those who participated in the low intensity intervention for two years. Aside from the interaction effects which were investigated, there appears to be a tendency for younger children,

Table 1.15

Age at Enrollment Comparison of Child Outcome Measures Collected at Reassessment #2 for the New Orleans V.I. Intensity Study

Variable		Low Intensity			High Intensity			Group	Age Status	Groups by Age
		Adj.$\bar{X}$	(SD)	n	Adj.$\bar{X}$	(SD)	n	*p* Value	*p* Value	*p* Value
CA at Pretest	Younger	7.1	(4.7)	7	4.9	(2.2)	7			
	Older	22.9	(7.3)	8	28.6	(6.1)	5			
• **Battelle Developmental Inventory (BDI)**										
Personal/Social	Younger	129.2	(27.6)	7	140.3	(25.5)	7	.69	.04	.58
	Older	89.9	(36.3)	8	82.2	(34.8)	5			
Adaptive	Younger	74.2	(17.2)	7	82.0	(13.1)	7	.48	.20	.72
	Older	59.9	(20.6)	8	63.2	(22.4)	5			
Gross Motor	Younger	56.0	(4.3)	7	55.1	(11.8)	7	.54	.62	.60
	Older	54.2	(11.3)	8	49.1	(11.8)	5			
Fine Motor	Younger	39.4	(3.6)	7	44.6	(6.0)	7	.98	.14	.17
	Older	33.1	(14.6)	8	27.6	(14.8)	5			
Communication	Younger	60.3	(15.7)	7	64.3	(13.3)	7	.62	.73	.94
	Older	54.5	(18.9)	8	59.7	(30.3)	5			
Cognitive	Younger	56.4	(8.4)	7	60.1	(8.1)	7	.71	.08	.35
	Older	35.8	(29.1)	8	25.[illegible]	(31.5)	5			
Total	Younger	415.4	(72.2)	7	446.5	(67.2)	7	.83	.11	.51
	Older	327.3	(122.4)	8	313.8	(139.0)	5			

Covariates included chronological age at pretest and BDI gross motor raw score.

regardless of group assignment, to score better on the BDI than children enrolled at an older age.

__Results of Reassessment #3__. Table 1.16 summarizes the Battelle Developmental Inventory and Vineland Adaptive Behavior Scales scores for Reassessment #3. Twenty-four subjects received the battery; one subject requested to be dropped from the study, and six subjects were unable to be located at the time of Reassessment #3. Again, no statistically significant differences were found between low versus high intensity groups. Effect sizes generally were negative, with a mean effect size of -.15.

Table 1.16

Reassessment #3 Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates♦	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	p Value	ES^
• **Average time between Pretest and Reassessment #3 (in months)**		39.5	(3.4)		13	39.9	(1.7)		11	.11	.74	.12
• **Age in months at Reassessment #3**		55.9	(9.9)		13	55.4	(13.6)		11	.01	.91	-.05
• **Battelle Developmental Inventory (BDI)**												
Personal/Social	1,2	136.8	(34.5)	130.8	13	118.5	(43.3)	124.4	11	.18	.68	-.19
Adaptive Behavior	1,2	83.6	(18.0)	79.9	13	75.3	(24.5)	79.0	11	.02	.90	-.05
Motor Total	1,2	113.6	(25.3)	106.6	13	87.3	(25.5)	94.3	11	2.11	.16	-.49
Communication	1,2	79.6	(25.1)	73.2	13	65.2	(29.0)	71.6	11	.04	.84	-.06
Cognitive	1,2	66.5	(29.9)	58.3	11	56.3	(24.7)	64.6	9	.58	.46	.21
TOTAL	1,2	482.2	(125.9)	450.8	13	398.5	(141.1)	430.0	11	.24	.63	-.17
• **Vineland Adaptive Behavior Scale (Standard Score)**												
Communication	3	99.2	(14.6)	93.2	12	84.4	(30.3)	90.4	11	.09	.77	-.19
Daily Living	3	91.0	(14.3)	83.6	12	79.0	(32.8)	86.4	11	.10	.76	.20
Socialization	3	97.4	(11.5)	93.2	12	86.0	(22.3)	90.2	11	.18	.68	-.26
Motor Skills	3	82.3	(15.6)	78.5	12	66.9	(25.5)	70.6	11	.74	.40	-.51
												$\bar{X}$ ES = -.15

♦ 1 = BDI gross motor raw, 2 = FRS Raw, 3 = BDI DQ Total

^ Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{X}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

__Educational services follow-up at Reassessment #3__. Information was gathered via parent report regarding the type of educational services their child received during the year. Such data was of interest to determine if the intervention possibly influenced later placement and degree of special services. A summary of the educational placements is presented in Table 1.17. There was a variety of educational placements and degrees of mainstreaming among both groups. Neither group appeared to differ significantly from the other.

Table 1.17

Educational Services Data Collected at Reassessment #3 for NO/VI Study

Variable	Low Intensity Group (n = 13)	High Intensity Group (n = 11)
GRADE		
Preschool/Kindergarten	9	9
Elementary		
No Educational Services	4	2
Don't Know		
Daycare		
TYPE OF PLACEMENT		
VI Only	1	3
Self-contained	2	3
Disabled/non-mixed	1	2
Regular program	3	1
Unknown	2	
Mainstreaming		
Not mainstreamed	1	1
Partial mainstreamed	4	7
All day	1	1
Unknown	3	
Not applicable	4	2

Results of Reassessment #4. As of July 1, 1992, there were 29 active subjects participating in the study to date. Also at this time, 23 subjects had completed the Reassessment #4 battery. The results of the child outcome data analysis are found in Table 1.18. There were no significant differences found between groups on the Battelle Developmental Inventory, the Vineland Adaptive Behavior Scores, or the Social Skills Rating System. Negative effect sizes resulted for the majority of the subscales, with a mean effect size of -.19. When viewing the sample as a whole, these children generally performed within one standard deviation of the mean on the Vineland and the SSRS.

Table 1.18

Reassessment #4 Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates♦	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	p Value	ES^
• **Average time between Pretest and Reassessment #4**		49.6	(3.0)		13	50.7	(3.1)		10		.41	.37
• **Age in months at Reassessment #4**		64.5	(10.7)		13	65.8	(16.3)		10		.81	.12
• **Battelle Developmental Inventory (BDI)**												
Personal/Social	1	139.5	(39.6)	135.0	13	125.6	(30.3)	130.2	10	.12	.73	-.12
Adaptive Behavior	1	89.1	(27.6)	86.0	13	81.7	(14.7)	84.8	10	.02	.90	-.04
Motor Total	1	115.8	(32.1)	111.5	13	100.7	(29.1)	105.0	10	.31	.58	-.20
Communication	1	84.1	(28.9)	79.4	13	69.1	(26.8)	73.8	10	.33	.57	-.19
Cognitive	1	73.8	(31.7)	68.6	13	58.6	27.6)	63.8	10	.23	.64	-.15
TOTAL	1	503.1	(154.3)	481.3	13	437.0	(114.7)	458.8	10	.21	.65	-.15
• **Vineland Adaptive Behavior Scale (Standard Score)**												
Communication	2	96.8	(15.6)	96.3	12	85.1	(23.6)	85.5	10	1.56	.23	-.69
Daily Living	2	93.2	(18.6)	92.2	12	80.9	(32.0)	81.9	10	.88	.36	-.56
Socialization	2	95.3	(14.0)	94.6	12	85.9	(25.5)	86.6	10	.85	.37	-.57
Composite	2	88.8	(21.6)	87.8	12	80.3	(28.8)	81.3	10	.37	.55	-.30
• **Boehm Basic Concepts, Total Score**	2	36.3	(11.9)	33.5	9	34.6	(16.2)	37.4	5	.31	.59	.33
• **Social Skills Rating System (Standard Scores)**												
Total (parent)	2	92.9	(15.8)	92.3	12	100.0	(28.4)	100.6	8	.69	.42	.53
Problem Behavior (parent)	2	105.8	(10.4)	106.5	12	105.1	(9.0)	104.5	8	.22	.64	-.19
Total (teacher)	2	107.5	(15.0)	107.4	8	94.9	(20.4)	94.9	7	1.63	.23	-.83
Problem Behavior (teacher)	2	100.0	(12.8)	97.6	7	100.0	(12.8)	99.9	7	.07	.80	.18
												$\bar{X}$ ES = -.19

♦ 1 = BDI gross motor raw score at pretest, 2 = Battelle Total DQ (developmental age ÷ chronological age) at pretest

^ Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{X}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

Educational services follow-up at Reassessment #4. Educational placement was also analyzed at the time of Reassessment #4 (see Table 1.19). At that point in time the majority of the children in both groups were in preschool or kindergarten. These placements appeared to have a high percentage of integration (including placements in regular classrooms) with more children in the low intensity group receiving services in a regular classroom environment. It is difficult to discern if the intervention influenced child placement by the time of Reassessment #4.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Data are reported for one year and two years following enrollment. Previously-described procedures were again implemented in the selection of covariates.

Table 1.19

Educational Services Data Collected at Reassessment #3

Variable	Low Intensity Group (n = 13)	High Intensity Group (n = 10)
GRADE		
Preschool/Kindergarten	8	6
Elementary	3	3
No Educational Services	2	1
TYPE OF PLACEMENT		
VI Only	1	1
Self-contained	1	3
Disabled/non-mixed	4	3
Regular program	5	2
Unknown	2	1
Mainstreaming		
Not mainstreamed	2	1
Partial mainstreamed	5	6
All day	6	2
Unknown		1

Reassessment #1. Table 1.20 represents results of analysis involving family functioning measures. One family declined to complete the measures, therefore data from the high intensity group included 13 rather than 14 subjects. Analysis of covariance was performed using pretest scores for BDI gross motor raw score and Family Resource Scale. No significant differences were found between groups on any of the family measures. In reviewing effect sizes based on the measures of stress, small but positive effect sizes resulted for the total score of the PSI child subdomain and total score, while negative effect sizes resulted for the FRS, FSS, and FACES III scores. However, these negative effect sizes were also negligible. The mean effect size for all family measures at Reassessment #1 was -.06.

Table 1.20

Reassessment #1 Measures of Family Functioning for Alternative Intervention Groups for NO/VI Intensity

		Low Intensity Group					High Intensity Group							
Variable	Covariates[◆]	$\bar{X}$	(SD)	Adj $\bar{X}$	%ile	n	$\bar{X}$	(SD)	Adj $\bar{X}$	%ile	n	ANCOVA F	p Value	ES[^]
• Average Length of Intervention		12.7	(2.0)			17	12.3	(.5)			14		.46	-.20
• **Parent Stress Index[#][@] (PSI)**														
Child Related Range (50 to 235)	1,2	107.2	(15.5)	109.7	75	17	109.5	(21.4)	107.0	70	13	.12	.73	+.17
Parent Range (47 to 270)	1,2	124.3	(24.2)	123.6	56	17	123.5	(20.9)	124.2	56	13	.00	.96	-.02
Total Range (101 to 505)	1,2	231.5	(30.7)	233.4	65	17	233.1	(38.7)	231.2	63	13	.02	.88	+.07
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**														
Adaptability	1,2	23.6	(10.0)	24.5		16	23.0	(3.8)	22.0		13	.57	.46	-.04
Cohesion	1,2	40.1	(10.2)	38.9		16	38.1	(19.1)	39.3		13	.03	.86	-.20
• **Family Resource Scale (FRS)[&][%]**	1,2	129.6	(10.8)	123.3	59	17	113.4	(20.0)	119.7	50	13	.45	.45	-.33
• **Family Support Scale (FSS)[&][%]**	1,2	35.6	(9.4)	34.2	71	16	29.7	(8.4)	31.1	63	13	.69	.41	-.33
• **Family Support Scale # of Sources**	1,2	15.9	(3.1)	16.1		16	16.8	(2.4)	16.7		13	.24	.63	+.19
													$\bar{X}$ ES =	-.06

[^] Effect size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a general discussion of the concept of effect size).

[◆] Covariates: 1 = BDI Gross Motor Raw Score; 2 = Family Resource Scale Raw Score

[$] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[#] Statistical analysis and effect size (ES) estimates for PSI was d on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with children with disabilities).

Analysis of parent-child interaction videotapes. The Multi-pass scheme (Marfo, 1989) was implemented for the coding of the parent-child interaction tapes. Multi-pass was designed primarily to study the notion of maternal directiveness in relation to the responses of parent and child to one another. The behavior count section of Multi-pass uses an event-based coding system targeting four types of parental directive behavior: 1) turn taking control, 2) response control, 3) topic control, and 4) inhibitive/intrusive control. The system also allows for a close analysis of verbal directiveness. Videotapes were sent directly to the author of Multi-pass to ensure accurate coding. Analysis of the raw data was conducted by the EIFI site coordinator. Multi-pass provides data on 40 specific behaviors; therefore, related

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variables were combined to reflect the four dimensions of parental directive behavior. Additionally, dimensions of child responsiveness were also developed by combining related behaviors.

Table 1.21 reports the results of preliminary Multi-pass scoring comparing the low versus high intensity groups. To date, 14 of the 31 Reassessment #1 videotapes have been coded. Due to this small number of subjects, only t-tests are reported rather than analysis of covariance. Results show that the groups did not differ significantly in regard to turn taking/control of parent (degree of balance in participation between parent and child), response control parent (extent to which

Table 1.21

Year #1 Reassessment Measures of Parent-Child Interaction for Alternative Intervention Groups for NO/VI Intensity Study

	Covariates&	Low Intensity				High Intensity				ANCOVA F	p Value	ES^
		$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n			
MULTI-PASS*												
• **Parent Behavior**												
Turn-Taking Control+		1.64	(.4)		7	1.67	(.4)		7		.86	-.08
Response Control+		5.58	(1.9)		7	4.35	(1.6)		7		.21	+.65
Inhibitions/Intrusions+		.52	(.2)		7	.25	(.1)		7		.00	+1.35
Imperatives/Implied+		2.90	(1.1)		7	2.71	(2.7)		7		.68	+.17
Instructional Behaviors		4.43	(2.3)		7	3.82	(1.0)		7		.56	-.27
• **Child**												
Response Control+		.59	(.5)		7	.27	(.2)		7		.18	+.64
Compliance with Inhibitions		.32	(.2)		7	.17	(.1)		7		.13	+.75
Compliance with Directions		1.88	(.8)		7	1.46	(.8)		7		.33	-.53
											$\bar{X}$ ES =	+.35
PARENT/CAREGIVER INVOLVEMENT SCALE												
• **Average Rating**												
Amount	1,2	2.9	(.7)	2.8	17	2.9	(.4)	3.0	12	.37	.48	.29
Quality	1,2	3.6	(.7)	3.5	17	3.7	(.5)	3.8	12	.94	.38	+.43
Appropriateness	1,2	3.8	(.8)	3.6	17	3.7	(.7)	3.8	12	.18	.67	+.25
• **General Impression**												
Availability	1,2	4.0	(.9)	4.0	17	3.9	(.8)	3.9	12	.06	.81	-.11
Acceptance	1,2	3.7	(1.0)	3.8	17	3.9	(.8)	3.9	12	.06	.82	+.10
Atmosphere	1,2	3.5	(.9)	3.4	17	3.8	(.8)	3.8	12	1.20	.29	+.44
Enjoyment	1,2	3.4	(.9)	3.4	17	3.5	(.7)	3.5	12	.21	.65	+.11
Learning Environment	1,2	3.3	(1.2)	3.1	17	3.3	(1.0)	3.4	12	.39	.54	+.25
Mean General Impression	1,2	3.6	(.9)	3.5	17	3.7	(.7)	3.7	12	.26	.61	+.22
											$\bar{x}$ ES =	+.21
PARENTAL BEHAVIOR RATING SCALE												
• Affective relationship with child	1,2	15.1	(3.4)	14.7	15	15.3	(3.0)	15.8	12	.77	.39	+.32
• Child Orientation	1,2	14.7	(3.7)	13.9	15	14.6	(3.5)	15.4	12	1.20	.29	+.41
• Performance orientation	1,2	12.1	(2.6)	11.9	15	12.6	(1.8)	12.8	12	.68	.42	+.35
											$\bar{x}$ ES =	+.36

^ Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

* All scores reflect frequency of occurrences divided by number of minutes recorded.

+ Higher scores associated with higher level of directiveness.

& Covariates: 1 = BDI gross motor raw score at pretest; 2 = FRS total; 3 = chronological age, pretest.

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parent behavior is directed at attempting to get the child to respond), response control of child (extent to which child behavior is directed at attempting to get the parent to respond), frequency of parent imperative, embedded, implied directives, frequency of child's compliance with these directives, frequency of parent instructional behaviors (labels, expands, gives and requests information, models, and reinforces). There was a statistically significant difference between groups on the frequency of parental inhibitions and intrusions (verbal or nonverbal behavior directed at stopping the child from engaging in an activity or behavior that is not considered to be dangerous/undesirable, or imposing the parental agenda at the cost of the child's interests) in favor of the high intensity group ($p \leq .05$). However, it should be noted that this was a very low frequency variable. Associated with the frequency of parental inhibiting behaviors is the frequency of child's compliance with parental inhibitions. Mean scores for compliance in the high intensity group were lower (though not significantly so), most likely due to the lower number of parental inhibitions which were directed toward them.

Reassessment #1 parent-child interaction tapes were also analyzed using the Parent/Caregiver Involvement Rating Scale (Farran et al., 1986). This scale is designed to assess the behavior of the caregivers (in this case, mothers) during play interactions. Behavior is rated in regard to the amount displayed, the quality, and the appropriateness of 11 behaviors: physical involvement, verbal involvement, responsiveness, play interaction, teaching behavior, control activities, directives given, relationship among activities, positive statements, negative statements, and goal setting. The tapes were rated by coders trained by Farran, who demonstrated strong adherence to standard procedures. The average rating scores reported reflect averages of the 11 behaviors. Amount was scored based on a 5-point Likert-type scale with a "3" being the most desirable score. An analysis of covariance were conducted for all the ratings using the BDI gross motor raw score, the FRS total score, and the child's chronological age at pretest. As shown in Table 1.18, both groups received almost ideal scores in regard to amount of behaviors, with no difference between the groups. Quality and appropriateness were scored based on a 5-point Likert-type scale, with "1" being worst and "5" being best. There were no statistically significant differences between the groups in regard to quality or appropriateness of these behaviors, with both groups receiving higher than average scores in regard to these two factors.

The coders using the Parent/Caregiver Involvement Scale also rated his/her general impressions of the caregiver depicted in the videotape. This included availability of the parent to the child, acceptance of the child, general atmosphere of the interaction, amount of enjoyment between parent and child, and parent's provision of a learning environment. These characteristics are also scored using a 5-point Likert-type scale, with "1" being poor and "5" being best. Scores for both groups were in the moderate range, with no significant differences between groups. Finally, a mean general impression score was calculated, revealing a minimal effect size in favor of the high intensity group. The mean effect size for the Parent/Caregiver Involvement Scale was .21 ("amount" not included).

Finally, the results of the Parental Behavior Rating Scale are presented in Table 1.21. The tapes were scored by Mahoney, the developer of the rating system. Three factor scores are reported, based on a factor analysis performed with the combined EIRI data set. As shown in Table 1.21 no significant differences were found between groups in regard to the parent's affective relationship with the child, the parent's affective relationship with the child, the parent's orientation/responsivity to the child, or the parent's orientation toward the child. The average effect size for the Parental Behavior Rating scale was .36.

Reassessment #2. The core family measures were again administered two years from date of pretest. The parents of one subject again refused to complete the family measures, therefore data on only 12 of the 13 subjects from the high intensity intervention were available for analysis. As depicted in Table 1.22, no statistically significant differences were found between intervention groups on most of the family measures. The average effect size for all the family functioning measures at Reassessment #2 was -.01. Percentile rank scores for the PSI, FRS, and FSS are also reported in the table. These scores reflect average levels of stress, resources, and supports for the families is a whole.

Table 1.22

Year 2 Reassessment Measures of Family Functioning for Alternative Intervention Groups for N.O./VI Intensity Study

Variable	Covariate[a]	Low Intensity Group x̄	(SD)	Adj.x̄	%ile	n	High Intensity Group x̄	(SD)	Adj.x̄	%ile	n	ANCOVA F	p Value	ES^
Average time between pretest and posttest	26.6	(3.1)			15	26.8	(5.0)			12		.93		
Parent Stress Index (PSI)[#@]														
Child Related (Range 50 to 250)	1,2	103.0	(13.0)	105.3	65	15	115.0	(21.4)	112.7	79	12	.95	.34	-.57
Parent (Range 54 to 270)	1,2	121.1	(15.9)	123.9	56	15	131.6	(24.4)	128.7	65	12	.29	.60	-.30
Total (Range 101 to 505)	1,2	224.7	(24.4)	230.2	62	15	246.8	(42.6)	241.4	72	12	.61	.44	-.46
Family Adaptation and Cohesion Evaluation Scales (FACES)														
Adaptability	1,2	22.3	(4.8)	22.8		15	19.9	(4.6)	19.4		11	2.12	.16	-.71
Cohesion	1,2	38.3	(5.2)	37.4		15	38.4	(7.4)	40.3		11	1.31	.26	.56
Family Resource Scale (FRS)[&\]	1,2	130.8	(13.5)	124.2	73	15	121.0	(20.1)	127.6	55	12	.35	.56	.25
Family Support Scale Total (FSS)[&\]	1,2	30.9	(8.0)	28.3	51	15	29.2	(11.1)	31.8	67	12	.87	.36	.44
FSS Sources[\]	1,2	14.5	(2.6)	14.8		15	15.1	(2.8)	14.7		12	.01	.91	-.04
													x̄ ES =	.01

[a] Covariates: 1 = BDI gross motor raw, 2 = Family Resource Scale.

[#] Statistical analysis and Effect Size (ES) estimates for PSI was based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[\] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[^] A low raw score and/or a high percentile score indicates lower stress level, and a positive ES is more desirable.

Subgroup analysis. The interaction of duration with intensity was also analyzed using family measures data collected at Reassessment #2. As shown in Table 1.23, there were no differences found as a result of duration of early intervention. There also was no interaction effect due to the age of the children.

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Table 1.23

Age at Enrollment Comparison of Family Functioning Measures Collected at Reassessment #2 for the New Orleans V.I. Intensity Study

Variable		Low Intensity			High Intensity			Group	Age Status	Groups by Age
		Adj.$\bar{x}$	(SD)	n	Adj.$\bar{x}$	(SD)	n	p Value	p Value	p Value
PSI Total	Younger	231.8	(27.4)	7	233.4	(44.0)	7	.55	.86	.61
	Older	208.3	(16.3)	8	235.8	(13.9)	4			
FSS Total	Younger	36.3	(6.4)	7	34.2	(11.2)	7	.94	.21	.54
	Older	24.2	(11.6)	8	27.0	(6.5)	4			
FRS Total	Younger	119.9	(16.9)	7	120.6	(21.7)	7	.98	.24	.89
	Older	135.3	(8.3)	8	134.2	(13.9)	4			
FACES Cohesion	Younger	36.0	(5.0)	7	42.0	(8.8)	7	.13	.91	.42
	Older	37.5	(5.4)	8	39.6	(4.3)	4			
FACES Adaptability	Younger	24.3	(6.6)	7	20.2	(5.7)	7	.21	.57	.68
	Older	20.9	(3.3)	8	18.7	(1.9)	4			

Covariates included chronological age at pretest and BDI gross motor raw score.

Reassessment #3. Results of family outcome data for a portion of the study sample is reported in Table 1.24. Data on 22 subjects are reported; one subject requested to be dropped from the study, one parent refused to complete the family measures portion of the assessment battery, and six subjects were unable to be located in time for testing. Using an analysis of covariance, no statistically significant differences were found between groups at the .05 level or greater. The cohesion subscale of the FACES III neared significance, in favor of the high intensity group, and the number of support sources based on the FRS neared significance in favor of the low intensity group. The average effect size for all the family measures was .26.

Reassessment #4. Family functioning measures of stress, adaptability, cohesion, resources, and support were collected and analyzed four years after pretest. As shown in Table 1.25, significant differences were found only on one variable, the Family Resource Scale (p = .01) in favor of the high intensity group. Differences on all the other variables were negligible, with an average effect size of .11. As a whole, the families reported stress to be within normal limits, with slightly higher stressors related to their children. Family resources and support

Table 1.24

Reassessment #3 Measures of Family Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity Group					High Intensity Group							
Variable	Covariate[$]	$\bar{x}$	(SD)	Adj.x	%ile	n	$\bar{x}$	(SD)	Adj.x	%ile	n	ANCOVA F	p Value	ES[^]
• **Average time between pretest and Reassessment #3 (in months)**		39.5	(3.4)			13	39.9	(1.7)			11	.11	.74	.12
• **Parent Stress Index[#@] (PSI)**														
Child Related Range (50 to 235)	1,2	104.4	(12.4)	106.3	64	13	106.1	(22.2)	104.2	67	9	.06	.81	+.17
Parent Range (47 to 270)	1,2	116.0	(15.7)	118.6	41	13	129.3	(21.4)	126.7	65	9	.82	.38	-.52
Total Range (101 to 505)	1,2	220.4	(25.5)	224.9	49	13	235.4	(41.0)	230.9	67	9	.14	.71	-.24
• **Family Adaptation and Cohesion Evaluation Scale (FACES)**					/									
Adaptability	1,2	20.5	(4.9)	21.2		13	25.2	(7.6)	24.6		9	1.24	.28	.69
Cohesion	1,2	37.5	(2.8)	36.7		13	40.0	(5.8)	40.8		9	4.19	.06	1.46
• **Family Resource Scale[&%] (FRS)**	1,2	130.9	(14.9)	125.6	73	13	125.0	(17.7)	130.3	63	9	.66	.43	.32
• **Family Support Scale[&%] (FSS)**	1,2	27.9	(9.7)	28.4	51	13	31.7	(12.1)	31.2	67	9	.26	.62	.29
• **Family Support Scale[&%] # of Sources**	1,2	16.7	(3.4)	17.1		13	14.2	(3.7)	13.8		9	3.74	.07	-.97
													$\bar{x}$ ES =	+.26

[$] 1 = BDI gross motor raw score at pretest, 2 = FRS total score at pretest.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[^] Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

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Table 1.25

Reassessment #4 Measures of Family Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity Group					High Intensity Group							
Variable	Covariate[§]	$\bar{x}$	(SD)	Adj.x	%ile	n	$\bar{x}$	(SD)	Adj.x	%ile	n	ANCOVA F	p Value	ES[^]
• **Average time between pretest and Reassessment #4 (in months)**		49.6	(3.0)			13	50.7	(3.1)			10	.72	.41	.37
• **Parent Stress Index[#@] (PSI)**														
Child Related Range (50 to 235)	1,2	104.3	(15.9)	106.3	67	12	110.1	(14.2)	108.2	71	9	.06	.81	-.12
Parent Range (47 to 270)	1,2	120.9	(15.9)	124.6	58	12	127.2	(17.2)	123.6	56	9	.02	.90	.06
Total Range (101 to 505)	1,2	225.5	(27.5)	230.8	63	12	237.3	(29.2)	231.8	64	9	.00	.95	-.04
• **Family Adaptation and Cohesion Evaluation Scale (FACES)**														
Adaptability	1,2	22.8	(4.4)	22.2		12	23.1	(5.0)	23.7		9	.39	.54	.34
Cohesion	1,2	39.3	(6.0)	39.3		12	37.7	(8.4)	37.7		9	.29	.60	-.27
• **Family Resource Scale[&%] (FRS)**	1,2	125.6	(16.7)	119.9	54	12	130.6	(11.90)	136.2	82	9	7.81	.01	.98
• **Family Support Scale[&%] (FSS)**	1,2	32.7	(10.0)	31.5	63	12	28.8	(12.1)	29.9	59	9	.08	.78	-.16
• **Family Support Scale[&%] # of Sources**	1,2	15.8	(3.3)	16.2		12	16.1	(2.8)	15.6		9	.16	.69	-.18
													$\bar{x}$ ES =	+.11

[§] 1 = BDI gross motor raw score at pretest, 2 = FRS total score at pretest.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[^] Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

was average to above average compared to the across-site population. The full cohort will have completed Reassessment #4 data by July, 1993. Therefore, these results are not conclusive.

Conclusions

Based on the results of data collected after 12 months of intervention, it appears that there are negligible effects due to the high intensity intervention on measures of child and family functioning. Child outcome measures at Reassessment #1 reflected mixed positive and negative effect sizes. Follow-up Reassessments #2 - #4 generally portrayed slight negative effect sizes. One significant difference did

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appear at Reassessment #1 when assessing behaviors that are less developmentally-based (i.e., the CRIB); specifically, the high intensity group scored significantly better in regard to exploring with other senses, a skill that is important for children with visual impairments.

Based on all of the data collected, there appear to be no general effects on family functioning due to more intensive early intervention. Although one or two variables tend to favor the high intensity groups at one of the Reassessments, there is no consistent pattern which would support findings in favor of one group or the other. In general, the families in this study appeared to have higher stress than families of children without disabilities. However, the intensity of the intervention received does not appear to have influenced that level of stress.

The investigation of the interventions impacting parent-child interaction was thoroughly conducted via three well-respected coding systems. Although only Reassessment #1 data have been scored at this point, the findings conclude that there were no differences due to intensity of intervention. The future analysis of parent-child interaction data is still valuable from the standpoint of providing insight into parents and children with a visual disability. To date, such an extensive data set has not been collected.

Although the results of this study are only based on 31 children immediately following one year of intervention (a relatively small number of children for intervention studies such as this), it is important to note that most of the previous experimental studies of the effects of early intervention with children with visual impairments were based on even smaller numbers. The findings of this study are substantially different than those from previous studies; therefore, it is important to reiterate the reasons why discrepancies may have occurred.

First, this study was based on a randomized experiment; few of the previously mentioned studies involved a control group for comparison. Furthermore, this study used diagnosticians who were uninformed as to subject assignment to assess child outcome variables, and efforts were also undertaken to ensure that the expected treatments were delivered as planned. Therefore, the difference in results between this study and previous research may be attributable to the quality of the research design.

Second, questions might be raised about the fact that intervenors were not certified in visual impairment. Although the intervenors were supervised by someone with a Ph.D. in visual impairment during the first year of intervention, the direct intervenors were not certified to serve the visually impaired. However, the high intensity intervention provided by this study, although perhaps not ideal, is not uncharacteristic of typical early intervention for children with visual impairments. The vast majority of certified VI personnel have received training focusing on school-age children and/or adults. The use of such certified instructors who lack the early childhood and family-focused training may be equally inappropriate. Currently, there are only a few personnel development programs in the United States which provide an emphasis in early intervention for children with visual impairments. The shortage of personnel with expertise in both early childhood and visual impairment is even greater than the scarcity of teachers certified to serve the visually impaired. A similar study featuring high intensity intervention provided by personnel certified in early childhood/visual impairment is the next logical step. Studies comparing treatment provided by intervenors certified to serve infants and toddlers who are visually impaired versus the generic early childhood/special educator would speak to this specialized training issue.

Based on the results of this study, it appears that the weekly home visit intervention was not cost-effective. Given the total cost of nearly $7,000 per child in agency resources, and the lack of general observable benefits for either families or children, one must consider if this funding may be spent more effectively in other ways. Perhaps funding should be used to support the use of visual impairment experts as consultants with families (perhaps contact on a monthly basis). Although this study raises such questions, replication is necessary before they can be definitively answered.

Third, it may be that children who are visually impaired, even at this young age, need much more comprehensive intervention services. Perhaps to achieve substantial benefits it is necessary to have intervention programs which deliver professionally mediated intervention on a daily basis to the children. This would mean the possibility of needing greater funding to be contributed to early intervention services.

A fourth possibility is that perhaps the focus of the intervention should change to provide primary support and assistance to the family rather than emphasize developmental therapy directed toward the child. Although the high intensity intervention in this study was consistent with what is delivered in most early intervention programs, it is possible that different findings may result through the application of completely different forms of interventions. Although Individualized Family Service Plans (IFSPs) were implemented, the intervention was primarily child-focused. Perhaps a more comprehensive orientation to the strengths and needs of the family should receive the primary emphasis, with minimal direct child contact. More intervention focused on parenting skills and coping behaviors may meet the immediate needs of parents with infants and toddlers. It is worth reiterating that the parents in the high intensity group did not have the benefit of participating in a parent support group; such contacts may be critical to parents of children with a specific disability.

In regard to long-term effects, there do not appear to be any significant differences between the groups as measured by the aforementioned instruments. However, it would be premature to conclude that neither of the interventions had an impact on later child and/or family functioning since not all children have completed Reassessment #4 or #5. As other studies have shown, effects of intervention often are not evident until longitudinal data have been collected (Infant Health and

Development Program, 1990). It may be that families with young children during the first three years initially benefit from less intense general support and access to resources, and that the individualized developmental intervention shows its effects in later stages (i.e., the early school years). These are issues which will require extended research.

SMA/LAKE McHENRY PROJECT

Project #2

COMPARISON: Infants and Toddlers ages Birth to Three years with Severe Disabilities--Once per week versus three times per week services.

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DATE OF REPORT: 10-1-1992

Rationale for Study

Although popular support for early intervention efforts has been strong, research on early intervention effectiveness has shed little light on important issues such as the relative effectiveness of various program intensities (White & Casto, 1985). The research base which has dealt with moderate to severe young children with disabilities is particularly sparse. It is only within the last 15 years, since the advent of P.L. 94-142, that children with significant impairments have been systematically included in early intervention programs (Bailey & Bricker, 1984). Thus, little is known about the optimal intensity of services to be provided to this group of children.

The implementation of P.L. 99-457 has focused attention on early intervention services in general and on services to infants and toddlers in particular. As states are developing plans to provide service to the youngest population of children with disabilities, questions are being raised regarding the most appropriate types of services to be provided. Peterson (1987) has discussed seven specific decisions which must be made regarding the development of a service delivery program, including who will be the target of service (e.g., child, mother, father, both parents, family), at what age services should begin, what services should be provided, in what setting the intervention program will be provided, who will be the primary intervention agent, in what social context services will be provided (e.g. individual or group program), and which agencies will provide services.

Although certain aspects of service delivery will be determined by practical and political forces (i.e., decisions regarding the agencies through which services will be delivered will be made at a state level based on the ability of different state agencies to perform this role) decisions regarding other aspects of service delivery can be facilitated by the availability of research data on the effectiveness of various approaches. Such data are particularly important in light of the cost issues (i.e., the cost of human as well as monetary resources) which various approaches to service delivery entail. However, the overriding issue should be, and is, how the services which are provided to infants and toddlers and their families can maximize their development. Decisions regarding the type of services to be provided are particularly important, as such decisions are directly related to both the cost of intervention as well as its effectiveness. Although a myriad of research questions on the relative costs and effects of different types of services can be asked, a very basic question is, "How many hours of service should be provided each week to maximize child and family functioning?"

According to Bricker (1986), one hour per week of individual services is a common service delivery model for children under age three, in either a home-based or center-based setting with the child and primary caregiver present. This model has face validity from both a cost and a practical perspective (i.e. it makes sense to provide a relatively low intensity of services to young children whose skill development needs are relatively restricted as a result of their age, as well as to recognize the parent's responsibility as a caretaker first and an intervention agent second). However, given the impetus of increased funding for infant and toddler services, the question of efficacy must be raised with regard to the appropriateness of such a relatively low intensity of service. A very important question is whether an increase in the frequency with which services are provided would result in greater gains in both child and family functioning?

Overview of Study

The purpose of this study was to address the question of the relative efficacy of different intensities of early intervention services for children with disabilities under age three. The study involved an experimental comparison of the costs and effects of serving children on either a one-hour-per-week or a three-hour-per-week basis. Three hours per week were selected as the greater level of intensity of services based on a number of factors. First, even a more intensive level of service must take into account the factors of child skill development needs as well as the parent's role in intervention. While 20 hours of individual services per week provides a very clear cut intensity comparison, it not only dramatically increases the parent's role as an intervention agent, but may be difficult to justify given the types of skills and rate of skill development expected of any child under age three. Costs of providing such services on an individual basis would also be extremely high. One hour three times per week, however, represents a level of service which is more intense than once per week, yet is not so intense that the parent's role is changed or expectations for child gains are exceeded. It was hypothesized that three times per week services would not only maximize the opportunity to intervene with particular child skills, but would increase the opportunity for program staff to provide family-oriented services as specified by P.L. 99-457.

To examine relative effectiveness of once-per-week vs. three-times-per-week services, a number of measures of child and family functioning were selected for this study. Some measures have been administered at pretest, one year, two years, three years, four years, and again at five years following the child's enrollment in the study. Other measures were administered at the first or second reassessment only. To assess intervention effects on the child, the Battelle Developmental Inventory (BDI) (Newborg et al., 1984) Bayley Scales of Infant Development (Bayley, 1969), Wisconsin Behavior Rating Scale (Song & Jones, 1980), and Scales of Independent Behavior (Bruininks, Woodcock, Weatherman, & Hill, 1984) were administered.

The BDI, which was administered at pretest and during each reassessment year, was selected to assess the child's overall development as well as skill development in five domains of functioning: Personal/Social, Adaptive, Motor, Communication, and Cognitive. The BDI allows for direct assessment and observation of child skills as well as use of parental report. The scale was developed for use with children birth to 8 years of age, thus facilitating the assessment of children of different ages on a longitudinal basis. The Bayley Scales, which were administered at the one year reassessment, were selected to provide a more fine-grained analysis of the child's cognitive and motor skills. The Bayley has also been used extensively in previous studies of early intervention; thus, their use would facilitate comparison of the results of this study to other work. The Wisconsin Behavior Rating Scale, administered at pretest and at one year reassessment, is completed by a specialist or educator who is familiar with the child, and thus allows for another source of data to be used to assess child skill development. The Early Development Scale (ED) and Short Form (SF) of the Scales of Independent Behavior (SIB) were administered at Year 2 reassessment to provide additional data on the extent to which interventions impacted the subjects' adaptive behavior. The SIB ED and SF were administered because there is evidence to suggest that age scores obtained on these scales may be significantly different for this population (Goldstein, Smith, Waldrup, & Inderbitten, 1987).

A battery of instruments which would allow for the assessment of the effects of intervention on the mothers and fathers of subjects was also administered. These instruments were selected to address criticisms of previous research in which the focus of assessment was restricted to child outcome measures (Mott et al., 1986). The instruments selected for use in this study were based on reviews of the literature on expected family outcomes, and variables with the potential to mediate family outcomes, and thus included measures of parent stress, social support, resources, family functioning, and life events and changes. The specific instruments included the Parenting Stress Index (Abidin, 1986), the Family Support Scale (Dunst et al., 1984), the Family Resource Scale (Dunst & Leet, 1985), the Family Adaptability and Cohesion Evaluation Scales (Olson et al., 1985), and the Family Inventory of Life Events and Changes (McCubbin et al., 1983). The Comprehensive Evaluation of Family Functioning Scale (McLinden, 1988), a new scale developed to assess the impact of the child with a disability in the family, was also administered to both the mothers and fathers at reassessments 2 and 3, and just the mothers at reassessments 4 and 5.

Methods

Subjects

A total of 72 children who were served by 3 different early intervention programs in the Chicago suburbs were included as subjects. Sixty children were reassessed one year after enrollment, 49 children were reassessed two years after enrollment, and 38 children were reassessed three and four years after enrollment. Forty-three subjects have been included in the fifth reassessment analysis, and, as the testing cycle for this year was not completed prior to this report, more subjects will be added for next year's report. Recruitment, assignment to groups, and demographic characteristics of the subjects are described below.

Recruitment. Subjects were recruited from three intervention programs in the Chicago suburbs. The three programs--South Metropolitan Association (SMA), Lake-McHenry Regional Program (LMRP), and Southwest Cooperative Association (SW Coop)--received funding from the State of Illinois Board of Education from July 1, 1985, through June 30, 1988, to investigate the effects on measures of child and family functioning of tripling the intensity of services that were then being provided to the birth to three population. All three programs had in the past provided once-per-week intervention services to children under age three. As a condition of receiving additional funding from the state, each agency agreed to provide three-times-per-week services to a randomly assigned experimental group, while continuing to provide once-per-week services to other children.

Between January 1, 1986, and June 30, 1987, all children who were referred to any of these three programs were considered for inclusion in the study if they were 24 months of age or less and had either a diagnosed disability or demonstrated overall developmental delay of 65% or more. A determination of developmental delay was made through a multidisciplinary team assessment conducted by the program as well as through completion of the Wisconsin Behavior Rating Scale by the member of the team assigned as the child's case manager. The age cutoff was included to ensure that all children would have an opportunity to participate in at least one year of early intervention services before moving on at age three to a preschool program operated by the public school system. Children who met the criteria were informed of the nature of the research project by program staff and asked to participate in the study. The requirement of random assignment to groups, and the possibility of obtaining three-times-per-week services, was emphasized. It was made clear that a decision not to participate in the study would in no way influence their ability to access the once-per-week services typically provided by the program.

Attrition

A total of 72 children and their families agreed to participate and were pretested in the study. Of these, approximately 25 families were not considered active by the fifth reassessment. The majority of these families were lost because they moved out of the Chicago area and did not leave a forwarding address or enough information to be tracked. Several of the subject parents were either dissatisfied with the services, or felt that the testing was too intrusive to continue. Four of the subject children passed away, and one subject family was placed in a witness protection program.

Despite the high attrition in the first three years of the study, the groups remained remarkably comparable for all reassessment analyses. Those variables that did show significant differences between groups were either not practically significant (e.g., mothers' ages being three years different), or were in favor of the expanded intervention group (e.g., percent with both parents living at home, and percent with mothers employed as technical/managerial or above). In each of these cases, the differences were accounted for by covariation when a strong relationship between that variable and any dependent measure appeared. Table 2.1 shows the comparability of the groups on demographic variables for subjects used in each analysis. It should be noted that the groups were more comparable on demographics for the subjects used in the fifth reassessment. Only the percent of families using public assistance showed any significant difference, and that variable did not relate to any of the outcomes.

Table 2.1

Comparability of Groups on Demographic Characteristics for SMA/Lake McHenry Project

	All Subjects Pretested								Subjects Included in Year #1 Analyses (Based on Pretest Demographics)							
	Basic Intervention			Expanded Intervention					Basic Intervention			Expanded Intervention				
Variable	x̄	(SD)	n	x̄	(SD)	n	p Value	ES	x̄	(SD)	n	x̄	(SD)	n	p Value	ES
Age of child in months at program entry	15.1	(6.4)	39	13.3	(6.4)	33	.24	-.28	15.0	(6.2)	31	13.7	(6.4)	29	.42	-.21
Age of mother in years	29.3	(5.8)	38	31.5	(4.9)	33	.08	.38	29.4	(5.3)	31	32.0	(5.1)	29	.06	.49
Age of father in years	31.9	(5.8)	35	33.2	(6.7)	33	.41	.22	31.7	(5.5)	28	33.7	(7.0)	29	.25	.36
Percent male	51		39	61		33	.46	.17	48		31	62		29	.31	.26
Years of education for mother	13.5	(1.9)	38	13.1	(1.6)	33	.30	-.21	13.6	(2.0)	31	13.0	(1.6)	29	.20	-.30
Years of education for father	14.1	(2.1)	35	13.6	(2.1)	33	.38	-.24	14.3	(2.0)	28	13.7	(2.1)	29	.28	-.30
Percent with both parents living at home	71		38	91		33	.05	.46	71		31	93		29	.04	.52
Percent of children who are Caucasian	82		38	97		33	.07	.42	81		31	97		29	.09	.43
Hours per week mother employed	10.6	(16.5)	38	6.9	(14.3)	32	.32	-.22	9.3	(15.5)	31	7.6	(14.9)	29	.68	-.11
Hours per week father employed	36.3	(14.3)	33	40.9	(9.8)	29	.15	.32	37.0	(14.0)	26	40.8	(10.4)	26	.27	.27
Percent of mothers employed as technical/managerial or above	11		38	25		32	.13	.36	13		31	28		29	.18	.34
Percent of fathers employed as technical/managerial or above	36		33	34		32	.87	-.04	29		26	34		28	.72	.09
Total Household income	$28,100	($21,058)	35	$29,516	($16,948)	32	.76	.07	$30,190	($22,258)	29	$29,982	($17,253)	28	.97	-.01
Percent receiving public assistance	21		33	23		26	.84	-.05	17		29	23		22	.63	-.13
Percent with mother as primary caregiver	97		33	97		30	.93	-.02	96		27	96		26	.97	-.01
Percent of children in daycare more than 5 hours per week	10		39	3		33	.34	-.22	13		24	3		22	.66	-.21
Number of siblings	1.1	(1.1)	38	1.2	(1.0)	33	.70	.09	.9	(.8)	31	1.2	(1.0)	29	.20	.38
Percent with English as primary language	92		38	100		33	.22	.29	90		31	100		29	.19	.33

(continued)

NOTE: Effect sizes from percentages were computed from a t statistic after an additional subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

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Table 2.1 (continued)

Comparability of Groups on Demographic Characteristics for SMA/Lake McHenry Project

	Subjects Included in Year #2 Analyses (Based on Pretest Demographics)								Subjects Included in Year #3 Analyses (Based on Pretest Demographics)							
	Basic Intervention			Expanded Intervention					Basic Intervention			Expanded Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES
Age of child in months at program entry	15.0	(6.4)	28	12.5	(5.6)	21	.16	-.39	15.8	(6.3)	22	12.4	(5.6)	16	.19	-.54
Age of mother in years	28.9	(5.3)	28	32.2	(5.2)	21	.03	.62	29.9	(5.4)	22	31.6	(4.8)	16	.32	.31
Age of father in years	31.2	(5.6)	25	33.2	(5.6)	21	.22	.36	31.3	(5.0)	21	32.7	(5.0)	16	.42	.28
Percent male	50		28	62		21	.45	.22	45		22	62		16	.34	.30
Years of education for mother	13.7	(2.1)	28	13.2	(1.7)	21	.39	-.24	13.7	(2.1)	22	13.5	(1.8)	16	.73	-.10
Years of education for father	14.4	(2.0)	25	14.1	(2.2)	21	.62	-.15	14.5	(2.0)	21	14.7	(2.2)	16	.76	.14
Percent with both parents living at home	71		28	90		21	.15	.41	86		22	94		16	.63	.16
Percent of children who are Caucasian	82		28	95		21	.26	.31	86		22	94		16	.63	.16
Hours per week mother employed	9.0	(15.4)	28	7.2	(14.4)	21	.68	-.12	8.9	(13.4)	22	8.6	(16.1)	16	.95	-.02
Hours per week father employed	38.3	(12.6)	23	40.5	(11.5)	18	.57	.17	40.1	(10.1)	20	40.6	(12.7)	15	.89	.05
Percent of mothers employed as technical/managerial or above	11		28	29		21	.13	.42	9		22	38		16	.05	.64
Percent of fathers employed as technical/managerial or above	25		28	38		21	.35	.26	27		22	52		16	.17	.43
Total Household income	$30,481	($23,251)	26	$32,775	($18,448)	20	.72	.10	$34,524	($33,250)	21	$34,700	($20,158)	15	.98	.01
Percent receiving public assistance	15		27	19		16	.68	-.12	5		21	8		12	.61	-.18
Percent with mother as primary caregiver	96		25	95		19	.79	-.08	95		20	93		14	.74	-.11
Percent of children in daycare more than 5 hours per week	11		28	05		21	.61	-.14	14		22	6		16	.63	-.16
Number of siblings	.9	(.7)	28	1.2	(.9)	21	.23	.45	.9	(.8)	22	.9	(.9)	16	.91	.00
Percent with English as primary language	89		28	100		21	.28	.31	91		22	100		16	.47	.23

(continued)

NOTE: Effect sizes from percentages were computed from a _t_ statistic after an additional subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

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Table 2.1 (continued)

Comparability of Groups on Demographic Characteristics for SMA/Lake McHenry Project

	Subjects Included in Year #4 Analyses (Based on Pretest Demographics)								Subjects Included in Year #5 Analyses (Based on Pretest Demographics)							
	Basic Intervention			Expanded Intervention					Basic Intervention			Expanded Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES
Age of child in months at program entry	15.0	(6.1	20	12.9	(5.9)	18	.30	-.34	15.5	(6.0)	21	12.5	(6.0)	22	.10	-.50
Age of mother in years	28.8	(5.0)	20	31.9	(4.4)	18	.05	.62	29.8	(5.6)	21	32.4	(5.2)	22	.13	.46
Age of father in years	30.7	(5.1)	19	33.1	(4.6)	18	.13	.47	31.6	(5.6)	20	34.7	(7.3)	22	.14	.55
Percent male	35		20	67		18	.06	.58	43		21	50		22	.67	.13
Years of education for mother	13.7	(1.9)	20	13.3	(1.7)	18	.60	-.21	13.8	(1.8)	21	13.2	(1.8)	22	.30	-.33
Years of education for father	14.2	(2.0)	20	14.4	(2.2)	18	.72	.10	14.3	(2.1)	21	14.1	(2.2)	22	.72	-.10
Percent with both parents living at home	85		20	89		18	.79	.08	81		21	91		22	.42	.24
Percent of children who are Caucasian	95		19	94		18	.96	-.02	90		20	95		22	.58	.17
Hours per week mother employed	7.8	(11.9)	20	7.7	(15.3)	18	.98	-.01	6.2	(10.8)	21	6.2	(12.7)	22	.99	.00
Hours per week father employed	40.1	(10.4)	19	40.2	(12.6)	15	.97	.01	38.1	(13.2)	21	42.3	(6.8)	19	.22	.32
Percent of mothers employed as technical/managerial or above	5		20	33		18	.04	.65	10		21	27		22	.18	.39
Percent of fathers employed as technical/managerial or above	33		18	47		17	.45	.25	42		19	38		21	.80	-.07
Total Household Income	$33,611	($22,775)	18	$32,676	($19,702)	17	.90	-.04	$34,875	($20,639)	20	$30,310	($18,870)	21	.49	-.22
Percent receiving public assistance	5		20	20		15	.22	-.40	5		19	31		16	.07	.60
Percent with mother as primary caregiver	94		18	94		16	.91	-.04	95		20	100		20	.57	.18
Percent of children in daycare more than 5 hours per week	15		20	6		18	.47	-.23	14		21	5		22	.37	-.27
Number of siblings	1.0	(0.8)	20	1.1	(0.9)	18	.69	.13	1.0	(.8)	21	1.2	(1.1)	22	.35	.25
Percent with English as primary language	90		20	100		18	.36	.29	95		21	100		22	.54	.18

NOTE: Effect sizes from percentages were computed from a _t_ statistic after an additional subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

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Table 2.2 shows the results of a series of 2 x 2 ANOVAs conducted to determine whether there were any statistically significant group by subject status (i.e., subjects who dropped versus those that did not) interactions. Differential attrition occurred for the Family Resource Scale for subjects included in reassessments 3, 4. and 5, the total Parenting Stress Index for subjects included in reassessment 4, and the Family Support Scale for subjects included in reassessments 4 and 5. As will be shown later on the comparison of groups on pretest measures, in each of these cases with the exception of the FRS, the group comparability after attrition was not compromised. In the case of the FRS, when appropriate, it was used as a covariate to account for these differences.

One interesting note from this analysis is that there was a difference between subjects who stayed in the analyses and those that did not. As the years passed, more and more lower income subjects failed to participate in testing. This is indicated by both income and father education variables. These differences do not affect the internal validity of the study, but might add some problems for externalization.

Assignment to groups. Subjects entered the study on a continuous basis as identified by the programs and were randomly assigned to groups by the EIRI coordinator. Data on the subject's disability and/or developmental status as provided by the program, and parent's level of stress as determined by the parent's score on the Parenting Stress Index (PSI) (Abidin, 1986) were used to stratify the subjects prior to random assignment. (A more detailed description of the procedures utilized to randomly assign subjects can be found in the Base Period Report.)

Table 2.2

Attrition Data for the SMA/Lake McHenry Intensity Study

		Low Intensity			High Intensity			ANOVA					
								Group		Study Status		Group by Status	
Variable		$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	F	p	F	p	F	p
Reassessment #1													
CA at pretest	IN	15.0	(6.2)	31	13.7	(6.4)	29	2.08	.15	0.28	.60	0.69	.41
	OUT	15.6	(7.5)	8	10.8	(6.6)	4						
BDI DQ*	IN	52.3	(27.5)	31	60.8	(26.0)	29	0.01	.92	0.30	.58	0.69	.41
	OUT	64.9	(32.2)	8	58.2	(26.1)	4						
Total PSI**	IN	248.3	(44.0)	31	235.9	(43.9)	29	0.23	.63	0.88	.35	0.16	.70
	OUT	229.5	(34.2)	8	228.3	(27.0)	4						
FRS	IN	120.1	(25.7)	29	118.0	(15.7)	27	0.81	.37	0.05	.82	1.39	.24
	OUT	112.9	(18.9)	8	128.7	(3.2)	3						
FSS	IN	30.5	(12.9)	30	27.7	(0.4)	29	0.65	.42	0.01	.92	2.37	.13
	OUT	25.0	(8.8)	7	34.0	(15.3)	4						
Mother Education	IN	13.6	(2.0)	31	13.0	(1.6)	29	0.01	.93	0.01	.93	0.82	.37
	OUT	13.0	(1.5)	7	13.5	(1.7)	4						
Father Education	IN	14.3	(2.0)	28	13.7	(2.1)	29	0.27	.61	1.64	.21	0.10	.75
	OUT	13.1	(2.3)	7	13.0	(2.4)	4						
Income	IN	$30,190	($22,258)	29	$29,982	($17,253)	28	0.36	.55	1.41	.24	0.40	.53
	OUT	$18,000	($9,649)	6	$26,250	($16,520)	4						
Percent Male	IN	48.0		31	62.0		29	0.00	.97	0.00	.95	0.60	.44
	OUT	63.0		8	50.0		4						
Reassessment #2													
CA at Pretest	IN	15.0	(6.4)	28	12.5	(5.6)	21	0.95	.33	0.72	.40	0.30	.59
	OUT	15.5	(6.9)	11	14.8	(7.5)	12						
BDI DQ*	IN	50.8	(28.4)	28	61.1	(25.2)	21	0.09	.76	0.86	.36	1.43	.24
	OUT	65.4	(27.5)	11	59.3	(27.3)	12						
Total PSI**	IN	246.8	(45.5)	28	243.0	(41.2)	21	0.98	.33	2.00	.16	0.40	.53
	OUT	238.5	(34.5)	11	221.1	(41.2)	12						
FRS	IN	120.5	(26.7)	26	116.9	(16.9)	21	0.35	.56	0.00	.95	1.52	.22
	OUT	113.9	(17.7)	11	124.1	(9.3)	9						
FSS	IN	29.3	(12.5)	27	26.9	(9.1)	21	0.04	.85	0.73	.40	0.38	.54
	OUT	30.0	(12.3)	10	31.3	(11.7)	12						
Mother Education	IN	13.7	(2.1)	28	13.2	(1.7)	21	0.45	.50	1.97	.17	0.12	.73
	OUT	12.9	(1.4)	10	12.8	(1.6)	12						
Father Education	IN	14.4	(2.0)	25	14.1	(2.2)	21	0.50	.48	5.72	.02	0.02	.89
	OUT	13.2	(2.2)	10	12.8	(1.7)	12						
Income	IN	$30,481	($23,251)	26	$32,775	($18,448)	20	0.26	.61	3.14	.08	0.00	.96
	OUT	$21,222	($11,111)	9	$24,083	($13,045)	12						
Percent Male	IN	50.0		28	62.0		21	0.37	.55	0.00	.97	0.10	.75
	OUT	55.0		11	58.0		12						

(continued)

* Developmental quotients were computed by dividing the age equivalent scores by chronological age

** Lower scores on the Parent Stress Index are considered better.

Table 2.2 (continued)

Attrition Data for the SMA/Lake McHenry Intensity Study

								ANOVA					
		Low Intensity			High Intensity			Group		Study Status		Group by Status	
Variable		$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	F	p	F	p	F	p
Reassessment #3													
CA at pretest	IN OUT	15.8 14.2	(6.3) (6.6)	22 17	12.4 14.1	(5.6) (7.0)	16 17	1.27	.26	0.00	.99	1.18	.28
BDI DQ*	IN OUT	55.0 54.8	(26.2) (32.2)	22 17	61.1 59.8	(27.7) (24.3)	16 17	0.72	.40	0.01	.91	0.01	.94
Total PSI**	IN OUT	242.0 247.6	(48.3) (34.6)	22 17	243.3 227.2	(46.8) (36.4)	16 17	0.90	.35	0.27	.60	1.16	.29
FRS	IN OUT	123.8 112.3	(27.3) (19.2)	20 17	115.7 122.9	(17.0) (12.4)	16 14	0.06	.81	0.18	.67	3.43	.07
FSS	IN OUT	29.6 29.3	(10.7) (14.5)	21 16	27.6 29.3	(9.2) (11.2)	16 17	0.13	.72	0.06	.81	0.13	.72
Mother Education	IN OUT	13.7 13.2	(2.1) (1.7)	22 16	13.5 12.6	(1.8) (1.4)	16 17	0.80	.37	2.64	.11	0.13	.72
Father Education	IN OUT	14.5 13.4	(2.0) (2.2)	21 14	14.7 12.6	(2.2) (1.5)	16 17	0.43	.52	10.71	.00	1.20	.28
Income	IN OUT	$34,524 $18,464	($23,249) ($12,707)	21 14	$34,700 $24,941	($20,158) ($12,392)	15 17	0.54	.47	8.16	.01	0.49	.49
Percent Male	IN OUT	46.0 59.0		22 17	63.0 59.0		16 17	0.50	.48	0.16	.69	0.50	.48
Reassessment #4													
CA at Pretest	IN OUT	15.0 15.2	(6.1) (7.0)	20 19	12.9 13.7	(5.9) (7.0)	18 15	1.32	.25	0.11	.75	0.04	.85
BDI DQ*	IN OUT	58.1 51.5	(23.5) (33.2)	20 19	62.7 57.7	(26.3) (25.3)	18 15	0.69	.41	0.80	.37	0.02	.90
Total PSI**	IN OUT	228.0 261.8	(33.7) (44.5)	20 19	244.3 223.8	(44.3) (37.3)	18 15	1.28	.26	0.49	.49	8.12	.01
FRS	IN OUT	126.4 111.0	(22.6) (24.0)	18 19	115.5 124.3	(16.1) (12.6)	18 12	0.06	.81	0.44	.51	5.95	.02
FSS	IN OUT	33.1 25.7	(11.5) (12.2)	19 18	27.5 29.7	(8.9) (11.7)	18 15	0.09	.77	0.93	.34	3.15	.08
Mother Education	IN OUT	13.7 13.3	(1.9) (2.0)	20 18	13.3 12.7	(1.7) (1.5)	18 15	1.13	.29	1.13	.29	0.11	.74
Father Education	IN OUT	14.2 13.8	(2.0) (2.2)	20 16	14.4 12.6	(2.2) (1.5)	18 16	1.06	.31	4.83	.03	2.33	.13
Income	IN OUT	$33,611 $22,265	($22,775) ($17,910)	18 17	$32,676 $25,933	($19,702) ($12,905)	17 15	0.09	.77	3.82	.06	0.25	.62
Percent Male	IN OUT	35.0 68.0		20 19	67.0 53.0		18 15	0.51	.48	0.74	.39	4.03	.05

* Developmental quotients were computed by dividing the age equivalent scores by chronological age

** Lower scores on the Parent Stress Index are considered better.

Table 2.2 (continued)

Attrition Data for the SMA/Lake McHenry Intensity Study

		Low Intensity			High Intensity			ANOVA					
								Group		Study Status		Group by Status	
Variable		$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	F	p	F	p	F	p
Reassessment #5													
CA at pretest	IN	15.5	(6.0)	21	12.5	(6.0)	22	0.73	.40	0.27	.61	1.21	.28
	OUT	14.6	(7.0)	18	15.0	(7.0)	11						
BDI DQ*	IN	55.8	(23.4)	21	59.0	(26.5)	22	0.89	.35	0.04	.85	0.22	.64
	OUT	53.9	(34.3)	18	63.4	(24.7)	11						
Total PSI**	IN	238.6	(33.3)	21	233.5	(41.7)	22	0.78	.38	0.67	.41	0.15	.70
	OUT	251.2	(51.3)	18	238.0	(44.3)	11						
FRS	IN	129.4	(16.2)	20	118.2	(16.6)	20	0.16	.69	4.73	.03	7.41	.01
	OUT	105.7	(26.4)	17	120.8	(12.6)	10						
FSS	IN	34.4	(11.7)	21	28.9	(9.0)	22	0.03	.87	5.61	.02	3.57	.06
	OUT	23.1	(10.2)	16	27.6	(12.7)	11						
Mother Education	IN	13.8	(1.8)	21	13.2	(1.8)	22	1.11	.30	1.13	.29	0.06	.80
	OUT	13.2	(2.0)	17	12.8	(1.4)	11						
Father Education	IN	14.3	(2.1)	21	14.1	(2.2)	22	1.44	.24	4.23	.04	0.54	.47
	OUT	13.6	(2.1)	14	12.6	(1.4)	11						
Income	IN	$34,875	($20,639)	20	$30,310	($18,870)	21	0.22	.64	3.72	.06	2.06	.16
	OUT	$19,067	($18,595)	15	$28,000	($13,210)	11						
Percent Male	IN	43		21	50		22	1.33	.25	4.30	.04	0.32	.58
	OUT	61		18	82		11						

* Developmental quotients were computed by dividing the age equivalent scores by chronological age

** Lower scores on the Parent Stress Index are considered better.

Demographic characteristics. Data on the demographic characteristics of all subjects enrolled in the study, as well as subjects in the experimental and control groups who participated in reassessments 1 through 5, are presented in Table 2.1. The total sample can be characterized as predominantly Caucasian and middle class. Most subjects lived in two-parent households in which fathers were employed full time and mothers were the primary caretakers for the child.

Intervention Programs

The two intervention groups received very similar types of service, but differed with regard to the frequency with which those services were provided, with the experimental group receiving three-times-per-week services and the control group receiving once-per-week services. The specific services provided are described below.

Basic intervention (once-per-week services). Children and primary caretakers in this group participated in a once-per-week contact with either an infant specialist (e.g., speech/language pathologist or occupational or physical therapist) or an early childhood special educator. While most contacts occurred at a center-based location, programs did allow the flexibility of conducting some of the contacts in the parent's home. Since the programs did not provide transportation to the children and their parents, the most common reason for providing a home visit was lack of transportation to the center. However, home visits were also provided when a particular teaching session could be most effectively accomplished in the home (e.g., when feeding or sleeping behaviors were of concern).

The content of the intervention sessions was directly related to the needs of the specific child and family as specified in the child's Individualized Education Plan (IEP). No specific curriculum was followed unless the individual specialist or educator found that doing so would be particularly advantageous in meeting the child and family's specific needs. Thus, the specialists and educators had a great deal of freedom in determining the activities to be done during the individual sessions. In general, there was a program expectation that the sessions would focus on improving child development in the domains of personal/social, adaptive, motor, language, and cognitive functioning, and that the sessions would also help parents to become intervenors for their child.

A major goal of the sessions was to provide a forum for parents to discuss issues of concern to them and to help them adapt to daily demands of caring for a child with a disability. During the first year, funding from the Illinois State Board of Education allowed the programs to hold a number of inservices to provide staff with additional training in providing family-focused intervention services (e.g., Dunst, Trivette, & Deal, 1988). This training emphasized the importance of addressing parent-identified needs as well as strengths in an effort to empower parents to become capable of dealing with the demands of caring for a child with special needs rather than relying solely on professional helpers and helping systems.

Expanded intervention (three-times-per-week services). Children who were assigned to this group participated in three, one-hour contacts per week with a specialist or educator. The content and focus of the sessions were the same as that for the control group. The increased staff contact time allowed for a wider range of IEP goals to be addressed, and the more frequent contact allowed more parent concerns and issues to be incorporated into the treatment sessions.

Treatment verification. A number of procedures were used to verify that treatment was implemented as intended. First, attendance data and parent ratings of satisfaction with the program were examined. The three-day-per-week group received 2½ times as many sessions as the basic group. Table 2.3 shows that this ratio held up for both years. In addition, the expanded group subjects were offered more than 2½ sessions per week in both years. It seems likely that the lower attendance rates observed are typical when more service hours are offered over time. Despite the statistical significance between attendance rates, and the lower than prescribed ratio of services, it seems clear from this data that the treatment was implemented as planned and that these figures represent the kind of attendance service deliverers should expect at these two levels of intensity.

Parents were also asked to rate their satisfaction with services on a 4-point scale in 7 areas. Results indicate that parents of subjects in each group were equally satisfied in both Year 1 and Year 2.

At the first reassessment, videotapes of a typical treatment session were also rated to determine the extent to which the intervention represented 'best practices.' The highest possible rating was 32. The results of group comparisons on these variables are contained in Table 2.3. The quality of intervention was ranked slightly higher for the control group. There was no statistically significant difference in the ranking of intervenors by their supervisors, or in the parents' satisfaction with services. Thus, the results obtained from the video rating seem to be a product of random fluctuation and the typically lower reliability associated with rating scales.

Table 2.3

Treatment Verification for SMA/Lake-McHenry Project for Year #1 and #2 Reassessments

Variable	Basic Intervention			Expanded Intervention			ANOVA F	p Value	ES
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n			
Reassessment #1									
Parent Rating of Satisfaction^	24.2	(4.2)	31	23.7	(3.2)	29	0.31	.58	-.12
Rating of Intervention+									
Quality of Session	19.9	(8.1)	29	16.1	(7.3)	26	3.20	.08	-.47
Ranking of Intervenor	1.1	(.4)	28	1.2	(.4)	26	0.24	.63	.25
Total # of Sessions Attended	26.9	(6.8)	31	63.7	(16.4)	29	132.60	.00	5.41
Total # of Sessions Offered	36.3	(4.8)	31	95.9	(13.5)	29	534.80	.00	12.42
Percent Attendance	74.1	(16.5)	31	66.8	(14.8)	29	3.25	.08	-.44
Reassessment #2									
Parent Rating of Satisfaction^	24.3	(2.6)	27	24.9	(2.5)	21	0.50	.48	.23
Total # of Sessions Attended	15.0	(7.8)	23	37.8	(24.2)	20	13.23	.00	2.92
Total # of Sessions Offered	19.9	(11.1)	23	53.4	(31.6)	20	22.75	.00	3.02
Percent Attendance	78.7	(14.4)	23	68.4	(19.1)	20	3.27	.08	-.64

+ Videotapes of a typical intervention session were scored by independent raters as to how well best practices were followed. Highest possible rating was 32.

^ Parents rated their satisfaction with the program in 7 areas on a scale of 1 = poor, 2 = fair, 3 = good, and 4 = excellent.

Contextual Variables. In addition to the attendance and parent satisfaction data, variables describing the context of the intervention for both groups were collected each year and are reported in Table 2.4. These contextual variables are presented in 5 sections for reassessments 1, 2, 4, and 5. Teacher rating of parents were not measured for reassessment 3. As can be seen, only one variable other than the teacher rating of parents was statistically significantly different across groups. That variable was the amount of speech therapy received during Year 2. One statistically significant variable is less than one would expect from simple random chance for the many variables reported in this table. Therefore, it seems that these groups had an almost identical history of context for all four years of this study.

Table 2.4

Comparison of Contextual Variables for Basic and Expanded Intervention Groups for SMA/Lake McHenry

	Basic Intervention			Expanded Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
Reassessment #1								
. **Child Health**[^]	2.0	(0.5)	31	1.8	(0.5)	29	.32	-.40
. **Demographics**								
Percent child living with both parents	79		29	93		29	.17	.35
Mothers' employment hrs/week	10.0	(18.4)	30	11.4	(17.1)	27	.77	.08
Annual Income	$29,661	($22,310)	31	$31,333	($19,497)	27	.76	.07
. **Family Variables**								
Family Resources (FRS)[&]	119.0	(23.8)	31	121.0	(15.1)	29	.71	.08
Family Life Events (FILE)[&]	10.3	(6.2)	31	11.1	(6.6)	29	.63	-.13
. **Teacher Rating of Parents**[$]								
Attendance	2.5	(0.7)	31	2.6	(0.6)	29	.66	.14
Support	2.4	(0.7)	31	2.8	(0.4)	29	.03	.57
Knowledge	2.1	(0.7)	31	2.5	(0.6)	29	.03	.57
. **Additional Services (% Received)**[#]								
> 5 hours/week daycare	19		31	24		29	.67	.11
Speech Therapy	16		31	21		29	.67	.11
Physical or Occupational Therapy	32		31	21		29	.35	-.24
Social Work Services	0		31	7		29	.28	.27
Home Nursing Services	7		31	17		29	.24	.29
Nutritional Services	3		31	10		29	.36	.29
Respite Services	10		31	3		29	.45	-.19
Parent Services	23		31	17		29	.65	-.12
Reassessment #2								
. **Child Health**[^]	1.9	(0.4)	27	1.9	(0.5)	21	.81	.00
. **Demographics**								
Percent child living with both parents	70		27	86		21	.27	.31
Mothers' employment hrs/week	9.5	(17.2)	28	9.8	(13.7)	21	.95	.02
Annual Income	$33,107	($24,273)	28	$40,588	($27,436)	18	.34	.31
. **Family Variables**								
Family Resources (FRS)[&]	119.0	(18.2)	28	120.1	(19.2)	21	.83	.06
Family Life Events (FILE)[&]	9.6	(7.2)	28	10.8	(5.9)	20	.55	-.17
. **Teacher Rating of Parents**[$]								
Attendance	2.6	(0.8)	12	2.8	(0.6)	14	.46	.25
Support	2.6	(0.5)	12	2.7	(0.6)	14	.56	.20
Knowledge	2.5	(0.7)	12	2.9	(0.3)	14	.04	.57
. **Additional Services (% Received)**[#]								
> 5 hours/week daycare	21		28	22		18	.89	.04
Speech Therapy	27		26	63		19	.02	.70
Physical or Occupational Therapy	50		26	58		19	.63	.14
Social Work Services	8		26	0		19	.47	-.21
Respite Services	15		26	37		19	.11	.46

(continued)

[$] Data are based on teacher rating of parents' attendance, support, and knowledge range (1-3). Higher scores indicate better ratings.

[&] Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for the FILE are based on raw scores. Lower scores represent less stress and are considered better.

[#] Annually, parents completed an additional services form which described other types of intervention or additional services the child and family received.

[^] Based on parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers

NOTE: ESs from percentages were computed from a t statistic after a subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

Table 2.4 (continued)

	Basic Intervention			Expanded Intervention			p	
	x̄	(SD)	n	x̄	(SD)	n	Value	ES
Reassessment #3								
• **Child Health**[^]	2.0	(0.6)	22	1.9	(0.6)	17	.94	-.17
• **Demographics**								
Percent child living with both parents	77		22	82		17	.77	.09
Mothers' employment hrs/week	10.4	(16.8)	21	12.8	(15.3)	17	.65	.14
Annual Income	$41,659	($23,260)	22	$49,000	($26,268)	15	.38	.32
• **Family Variables**								
Family Resources (FRS)[&]	121.4	(17.2)	22	118.9	(14.4)	15	.65	.15
Family Life Events (FILE)[&]	9.8	(7.6)	22	10.5	(7.5)	15	.78	-.09
• **Additional Services (% Received)**[#]								
Speech Therapy	26		23	24		17	.90	.04
Physical or Occupational Therapy	35		23	24		17	.51	.20
Social Work Services	4		23	0		17	.73	.11
Respite Services	18		22	35		17	.25	-.35
Reassessment #4								
• **Child Health**[^]	2.0	(0.3)	18	1.9	(0.6)	16	.47	-.33
• **Demographics**								
Percent child living with both parents	76		17	88		16	.50	.23
Mother's employment hrs/week	11.7	(14.8)	17	15.2	(18.7)	13	.58	.24
Annual Income	$42,618	($20,862)	17	$47,333	($27,734)	15	.59	.23
• **Family Variables**								
Family Resources (FRS)[&]	120.3	(16.4)	14	118.9	(17.0)	14	.83	-.09
Family Life Events (FILE)[&]	9.1	(5.6)	17	8.6	(7.6)	16	.83	.09
• **Teacher Rating of Parents**[$]								
Attendance	2.6	(0.5)	9	2.3	(0.8)	6	.53	-.60
Knowledge	2.7	(0.5)	9	2.3	(0.8)	6	.34	-.80
• **Additional Services (% Received)**[#]								
> 5 hours/week daycare	25		20	33		18	.61	-.16
Speech Therapy	59		17	44		16	.87	.05
Physical or Occupational Therapy	59		17	50		16	.65	.15
Social Work Services	6		17	0		16	.60	.18
Respite Services	6		17	19		16	.35	-.31
Reassessment #5								
• **Child Health**[^]	2.1	(0.5)	20	1.9	(0.6)		.27	-.40
• **Demographics**								
Percent child living with both parents	89		18	100		20	.26	.35
Annual Income	$38,075	($19,041)	20	$38,972	($22,026)	18	.89	.05
• **Family Variables**								
Family Resources (FRS)[&]	122.9	(15.7)	21	120.9	(15.2)	21	.68	-.13
Holmes & Rahe Major Life Events								
Raw Score	160.5	(113.7)	21	164.1	(116.3)	22	.92	-.03
Negative Events Score	32.3	(34.6)	21	30.7	(48.4)	22	.90	.05
• **Teacher Rating of Parent**[$]								
Support	16.7	(3.4)	18	17.4	(3.1)	18	.51	.21
Knowledge	9.2	(2.2)	18	9.7	(1.4)	18	.37	.23
• **Additional Services (% Received)**[#]								
Speech Therapy	0		21	21		19	.06	.58
Physical or Occupational Therapy	29		21	26		19	.89	-.04

[$] Data are based on teacher rating of parents' attendance, support, and knowledge range (1-3). Higher scores indicate better ratings.

[&] Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for the FILE are based on raw scores. Lower scores represent less stress and are considered better.

[#] Annually, parents completed an additional services form which described other interventions or additional services the child and family received.

[^] Based on parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers

NOTE: ESs from percentages were computed from a t statistic after a subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

The differential results indicated by the teacher rating of parents shows that the parents of subjects in the expanded group demonstrated more support for the program in Year 1 and had more knowledge appropriate for the benefit of their child in Years 1 and 2. This would be another indication that the treatment was delivered as planned. Overall, the contextual variables show how comparable the groups' experiences have been outside of treatment over the course of this study.

Cost of alternative interventions. Program costs were calculated using the ingredients approach (Levin, 1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). Table 2.5 summarizes average cost per child for 3 days per week versus 1 day per week in the SMA and Lake McHenry locations. These two programs were used as the basis for the calculations since they served the majority of the children included in the project. As can be seen from the table, the cost necessary to expand services from one day per week to three days per week is an additional 6,304 dollars per child.

Table 2.5

Costs per Child for SMA/Lake McHenry (1990 Dollars)

	1 x per week	3 x per week
Direct Services	$2,293	$ 5,561
Administration	979	2,937
Facilities	210	631
Equipment	59	178
Materials/Supplies	83	251
Transportation	83	248
Utilities, Insurance, Miscellaneous	103	308
TOTAL	**$3,810**	**$10,114**

* *Totals may not equal due to rounding errors*

Data Collection

All subjects were tested at program entry and then again one, two, three, four, and five years after enrollment into the program. Table 2.6 indicates the schedule of assessment for the pretest and the five reassessments. Table 2.7 gives a simple description of each of the dependent and contextual measures used for testing. Data collection procedures are described below.

Table 2.6

Schedule of Administration and Test Administration for SMA/Lake McHenry Intensity Study

	Pretest	Reasses. #1	Reasses. #2	Reasses. #3	Reasses. #4	Reasses. #5
CHILD MEASURES						
Battelle Developmental Inventory	X	X	X	X	X	X
Bayley Scales		X				
Wisconsin	X	X				
Scales of Independent Behavior			X			
Child Behavior Checklist				X		
Social Skills Rating Scale						X
FAMILY MEASURES						
Parent Stress Index	X	X	X	X	X	
Family Support Scale	X	X	X	X	X	X
Family Resource Scale	X	X	X	X	X	x
Family Inventory of Life Events and Changes	X	X	X	X	X	
Family Adaption and Cohesion Evaluation Scales	X	X	X	X	X	
Comprehensive Evaluation of Family Functioning			X	X	X	
Parent Self-Awareness Scale						X
Holmes & Rahe Major Life Events						X

Table 2.7

Description of Tests Administered for SMA/Lake McHenry Intensity Study

MEASURES	DESCRIPTION
CHILD MEASURES	
Battelle Developmental Inventory (BDI) (Newborg et al., 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Scales of Independent Behavior (SIB) (Bruininks et al., 1985)	The SIB is a norm-referenced test which assesses functional independence/adaptive behavior of a child. It is organized into four subdomains: motor skills, and communication skills, personal living skills, and community living skills.
Bayley Scales of Infant Development (Bayley, 1969)	A norm-referenced test which measures infant mental and motor development. It is completed using child administration and parent interview.
Wisconsin Behavior Rating Scale (Song et al., 1984)	A norm-referenced and criterion-referenced test which assesses basic survival skills in 11 areas.
Child Behavior Checklist (Achenbach & Edelbrock, 1986)	A norm-referenced test which assesses problem behaviors and competencies through parent report.
Social Skills Rating Scale (Gresham & Elliott, 1990)	A norm-referenced measure of child social skills and school success. Ratings are obtained from the child's parent and teacher.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1986)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst, & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: general resources, time availability, physical resources, and external support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, marital, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptability and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing family level of adaptability/cohesion. Family cohesion assesses degree of separation or of family members to family. Adaptability assesses the extent to which family is flexible and able to change in various situations. The scale also has a perceived and ideal form that provides an indication of extent to which current family functioning is consistent with family expectation for ideal family functioning.
Comprehensive Evaluation of Family Functioning (CEFF) (McLinden, 1989)	Assesses areas in which a family having a child with special needs may be affected. Areas assessed are: time demands, acceptance, coping, social relationships, financial demands, well-being, and sibling relationships.
Parent Self-Awareness Scale (PSAS) (Snyder et al., 1985)	Assesses parent perceptions of empowerment in the areas of decision making, obtaining information, and in interactions with self and others.
Holmes & Rahe Major Life Events (Holmes & Rahe, 1967)	Assesses parent stress resulting from major life events that occurred within the past year.

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Interobserver agreement was calculated for eight BDI administrations and two Bayley administrations. Mean percent agreement was 92.4% for the BDI, 94% for the Bayley Mental Scale, and 100% for the Bayley Motor Scale.

Pretest data collection. Pretesting was accomplished in two phases. The first phase of pretest data collection occurred at the time that parents consented to participate in the study. At that time, parents completed the Parenting Stress Index, and the educator or specialist assigned to the family's case completed the Wisconsin Behavior Rating Scale. These data were then used for stratification purposes during random assignment.

After the subjects had been assigned to a group, the diagnostician contacted the parent and scheduled a testing session to complete the remainder of the pretest battery, consisting of the Battelle Developmental Inventory (BDI), the Family Support Scale (FSS), Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and Family Adaptability and Cohesion Evaluation Scales (FACES III). Testing occurred at one of the program sites closest to the parent's home, although in some instances it was necessary to schedule testing at the home. Parents were paid $20 to participate in the approximately 1½ hour testing session. Most subjects were tested within two weeks of their assignment to groups.

Year 1 reassessment. The first reassessment was scheduled 12 months after the date upon which the subject first entered services. However, the average amount of time between pretest and the first reassessment was less than 12 months, due primarily to delays in pretesting some of the children. The time between pretest and the first reassessment did not, however, differ significantly across groups.

The reassessment battery consisted of a large number of child and family measures, which necessitated the scheduling of two separate testing sessions. The first session, which lasted approximately 1¾ to 2¼ hours and for which parents were paid $20, included the administration of the BDI, PSI, FILE, FRS, FSS, and FACES III. The second session, which lasted approximately 1½ hours and for which parents were paid $15, included administration of Bayley Scales of Infant Development, Parent Survey Form, Parent Report of Child's Health, and Parent Satisfaction with Services. A videotape of an interaction session between the child and his/her primary caregiver was also made at this time. Each child's specialist or educator also completed the Wisconsin Behavior Rating Scale at the time of the first reassessment.

Year 2 reassessment. Subjects were tested again two years after their initial program entry date. The reassessment battery was administered in two sessions in a manner similar to the first reassessment. The second reassessment differed from the first reassessment as follows: (1) The Scales of Independent Behavior replaced the Bayley Scales and the Wisconsin Behavior Rating Scale as a child outcome measure, (2) Fathers and mothers completed the Comprehensive Evaluation of Family Functioning Scale, and (3) Fathers completed the FSS and FACES III.

Year 3 reassessment. Subjects were tested again three years after their initial program entry date. The reassessment battery was administered in only one session. Some of the parent forms (parent survey, satisfaction questionnaire, and health form) were sent to the parents to be completed before the testing session, and data on additional services were collected by the assessment coordinator in a phone call with the parent after testing had been completed. One other measure (teacher rating form) was completed by the child's current teacher. Other measures for the third reassessment included the Child Behavior Checklist (CBC) to assess possible problem behaviors and the Comprehensive Evaluation of Family Functioning (completed by both mothers and fathers) to obtain a more global assessment of the subject families. Fathers also completed the FSS and FACES III.

Year 4 reassessment. Subjects were tested again four years after their program entry date. The reassessment battery for child measures was again done in one session. And as in previous years, some of the parent forms were sent to parents to be completed before the testing session. All measures used in third reassessment were again used in the fourth reassessment with one exception; the CEFF was only completed by the mothers.

Year 5 reassessment. Subjects were tested again five years after their program entry date. The reassessment battery for child measures was done in one session. One additional child measure was given for Year 5, that was the Social Skills Rating Scale; this scale was completed by the subject's teacher. Parent forms were sent to the parents so that the forms could be complete when the child's session was scheduled. The Parenting Stress Index and the Family Inventory of Life Events and Changes were replaced by the Holmes and Rahe Major Life Events Scale. In addition, the use of the FACES were also discontinued. All other family measures were given as usual, with the CEFF being filled out by the mothers. An additional measure of family functioning was given to parents (Parent Self-Awareness Scale) to assess perceived empowerment of family decision makers.

Results and Discussion

Pretest Comparisons

Results of comparisons of the Expanded and Basic Services groups on the measures collected at pretest for all subjects as well as those subjects included in all reassessments are presented in Table 2.8. probability values presented in the table are based on one-way analysis of variance. Group differences appeared for the FACES adaptability score with all pretested subjects, the FILE for subjects used in Reassessments #3 and #4, and the FRS for subjects used in Reassessment #5. An examination of all other values indicated that, at pretest, experimental and control groups were not statistically significantly ($p < .10$) different on any of the measures of child or family functioning and that attrition did not significantly affect the comparability of groups at any assessment. The few differences observed are accounted for in the analysis using them as covariates when appropriate.

Table 2.8

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	All Pretested Subjects								Subjects Included in Year #1 Reassessment										
	Basic Intervention			Expanded Intervention					Basic Intervention				Expanded Intervention						
Variable	X̄	(SD)	n	X̄	(SD)	n	ES^	P Value	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	ANOVA F	ES^	P Value
• Age in months at pretest	15.1	(6.4)	39	13.3	(6.4)	33	-.28	.24	15.2	(6.1)		18	12.5	(5.8)		17	1.78	-.44	.19
• **Battelle Developmental[*] Inventory (BDI)**																			
Raw Scores for:																			
Personal Social	30.9	(16.5)	39	31.0	(16.4)	33	.01	.98	30.4	(16.1)		31	31.6	(16.8)		29	0.08	.07	.78
Adaptive Behavior	25.2	(13.6)	39	24.8	(13.1)	33	-.03	.92	24.0	(13.3)		31	25.2	(13.0)		29	0.13	.09	.72
Motor	34.7	(26.3)	39	32.5	(23.1)	33	-.08	.72	32.9	(25.0)		31	32.0	(23.1)		29	0.00	-.04	.99
Communication	16.6	(8.0)	39	16.9	(9.0)	33	.04	.86	16.2	(7.9)		31	17.3	(9.3)		29	0.25	.14	.62
Cognitive	14.8	(9.1)	39	15.2	(8.4)	33	.04	.86	14.5	(9.0)		31	15.6	(8.3)		29	0.23	.12	.64
TOTAL	122.2	(71.6)	39	120.5	(67.5)	33	-.02	.92	117.9	(69.2)		31	122.5	(67.7)		29	0.07	.07	.80
• **Parenting Stress Index[§♦] (PSI)** Percentile Rank																			
Child Related (range 47 to 235)	117.3	(27.1)	39	110.3	(19.8)	33	.26	.22	119.9	(28.0)	88	31	111.1	(19.9)	76	29	1.94	.31	.17
Other Related (range 54 to 270)	127.1	(23.1)	39	124.7	(28.7)	33	.10	.70	128.4	(24.8)	63	31	124.8	(30.5)	58	29	0.25	.15	.62
TOTAL (range 101 to 505)	244.4	(42.4)	39	235.0	(41.9)	33	.22	.35	248.3	(44.0)	78	31	235.9	(43.9)	67	29	1.18	.28	.28
• **Family Adaptability and[+] Cohesion Evaluation Scales (FACES)**																			
Adaptability	21.1	(5.2)	38	24.7	(6.3)	33	.69	.07	22.1	(5.4)		30	24.6	(6.3)		29	1.10	.46	.11
Cohesion	38.1	(7.9)	38	37.6	(7.0)	33	-.06	.79	37.4	(7.7)		30	38.1	(6.8)		29	0.01	.09	.69
• **Family Resource Scale[§&] (FRS)**	118.5	(24.3)	37	119.0	(15.2)	30	.02	.92	120.1	(25.7)	54	29	118.0	(15.7)	50	27	0.13	-.08	.71
• **Family Index of Life[♦§] Events (FILE)**	11.3	(7.9)	38	12.6	(7.2)	33	-.16	.47	10.9	(8.1)	34	30	12.6	(6.0)	24	29	0.75	-.21	.39
• **Family Support Scale[§&] (FSS)**	29.5	(12.3)	37	28.5	(10.2)	33	-.08	.71	30.5	(12.9)	63	30	27.7	(9.4)	50	29	0.91	-.22	.34

(continued)

[♦] Statistical analysis and Effect Size (ES) for PSI and FILE were based on raw scores where low raw scores and positive ES are most desirable.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[§] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal studies.

[*] Statistical analysis for BDI scores was conducted using raw scores for each of the scales.

[+] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

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Table 2.8 (continued)

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	Subjects Included in Year #2 Reassessment									Subjects Included in Year #3 Reassessment								
	Basic Intervention			Expanded Intervention						Basic Intervention			Expanded Intervention					
Variable	X	(SD)	n	X	(SD)	n	ANOVA F	ES^	P Value	X	(SD)	n	X	(SD)	n	ANOVA F	ES^	P Value
• Age in months at pretest	15.0	(6.4)	28	12.5	(5.6)	21	2.02	-.39	.16	15.8	(6.3)	22	12.4	(5.6)	16	2.88	-.54	.10
• **Battelle Developmental* Inventory (BDI)**																		
Raw Scores for:																		
Personal Social	30.4	(16.9)	28	28.1	(12.4)	21	0.26	-.14	.62	33.9	(16.8)	22	28.2	(14.1)	16	1.23	-.34	.27
Adaptive Behavior	23.5	(13.6)	28	23.4	(9.3)	21	0.00	-.01	.98	26.1	(13.8)	22	23.4	(10.0)	16	0.42	-.20	.52
Motor	31.7	(25.9)	28	29.0	(17.0)	21	0.17	-.10	.68	36.2	(27.3)	22	29.8	(19.2)	16	0.66	-.23	.42
Communication	15.9	(8.3)	28	14.8	(6.9)	21	0.25	-.13	.62	17.5	(8.3)	22	14.3	(7.0)	16	1.56	-.39	.22
Cognitive	14.2	(9.3)	28	14.5	(6.4)	21	0.02	.03	.89	16.0	(9.0)	22	14.3	(6.9)	16	0.37	-.19	.55
TOTAL	115.6	(72.1)	28	109.9	(48.1)	21	0.10	-.08	.75	129.7	(73.5)	22	110.0	(53.4)	16	0.83	-.27	.37
• **Parenting Stress Index♠ (PSI) Percentile Rank**																		
Child Related (range 47 to 235)	120.9	(29.3)	28	115.0	(16.5)	21	0.70	.20	.37	118.6	(30.1)	22	115.1	(17.6)	16	0.17	.12	.66
Other Related (range 54 to 270)	125.9	(24.0)	28	128.0	(32.0)	21	0.07	-.09	.79	123.4	(26.2)	22	128.2	(36.7)	16	0.22	-.18	.64
TOTAL (range 101 to 505)	246.8	(45.5)	28	243.0	(41.2)	21	0.09	.08	.76	242.0	(48.3)	22	243.3	(46.8)	16	0.06	-.03	.93
• **Family Adaptability and+ Cohesion Evaluation Scales (FACES)**																		
Adaptability	22.6	(5.3)	27	23.6	(6.7)	21	1.73	.19	.59	24.0	(4.8)	21	23.7	(7.0)	16	0.03	-.06	.85
Cohesion	38.3	(7.2)	27	37.8	(6.4)	21	0.04	-.10	.72	39.0	(7.7)	21	38.0	(6.8)	16	0.15	-.13	.70
• **Family Resource Scale▲ (FRS)**	120.5	(26.7)	26	116.9	(16.9)	21	0.29	-.13	.59	123.8	(27.3)	20	115.7	(17.0)	16	1.08	-.30	.31
• **Family Index of Life♠ Events (FILE)**	10.7	(8.6)	27	13.2	(6.2)	21	1.27	.29	.27	9.9	(6.6)	21	13.6	(6.5)	16	2.99	-.56	.09
• **Family Support Scale▲ (FSS)**	29.3	(12.5)	27	26.9	(9.1)	21	0.54	-.19	.46	29.6	(10.7)	21	27.6	(9.2)	16	0.36	-.19	.55

(continued)

♠ Statistical analysis and Effect Size (ES) for PSI and FILE were based on raw scores where low raw scores and positive ES are most desirable.

▲ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

* Statistical analysis for BDI scores was conducted using raw scores for each of the scales.

+ Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

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Table 2.8 (continued)

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	Subjects Included in Year #4 Reassessment									Subjects Included in Year #5 Reassessment							
	Basic Intervention			Expanded Intervention						Basic Intervention			Expanded Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	ANOVA F	ES	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	ES^	P Value
• **Age in months at pretest**	15.0	(6.1)	20	12.9	(5.9)	18	1.12	-.34	.30	15.5	(6.0)	21	12.5	(6.0)	22	-.50	.10
• **Battelle Developmental Inventory (BDI)**[*]																	
Raw Scores for:																	
Personal Social	33.2	(15.4)	20	29.3	(13.0)	18	0.69	-.25	.41	31.9	(14.7)	21	28.5	(14.2)	22	-.23	.45
Adaptive Behavior	25.6	(12.2)	20	24.2	(9.7)	18	0.15	-.11	.70	24.9	(11.9)	21	22.7	(12.0)	22	-.18	.56
Motor	35.0	(26.0)	20	30.1	(18.0)	18	0.45	-.19	.51	33.9	(23.3)	21	27.6	(20.2)	22	-.27	.35
Communication	17.6	(7.5)	20	15.6	(7.1)	18	0.70	-.27	.41	16.9	(6.9)	21	15.9	(8.6)	22	-.14	.69
Cognitive	16.2	(8.0)	20	15.1	(6.8)	18	0.20	-.14	.65	15.9	(7.7)	21	14.7	(8.1)	22	-.16	.62
TOTAL	127.5	(67.1)	20	114.3	(50.7)	18	0.46	-.20	.50	123.4	(62.1)	21	109.4	(60.7)	22	-.23	.46
• **Parenting Stress Index (PSI) Percentile Rank**[♠]																	
Child Related (range 47 to 235)	109.5	(18.7)	20	113.2	(16.8)	18	0.43	-.20	.52	115.8	(24.7)	21	110.8	(19.8)	22	.20	.46
Other Related (range 54 to 270)	118.5	(21.9)	20	131.1	(32.8)	18	1.98	-.58	.17	122.8	(18.7)	21	122.7	(29.3)	22	.01	.99
TOTAL (range 101 to 505)	228.0	(33.7)	20	244.3	(44.3)	18	1.66	-.48	.21	238.6	(33.3)	21	233.5	(41.7)	22	.15	.66
• **Family Adaptability and Cohesion Evaluation Scales (FACES)**[+]																	
Adaptability	24.1	(5.0)	19	23.6	(6.8)	18	0.11	-.10	.74	23.7	(5.2)	21	24.2	(6.4)	22	.10	.80
Cohesion	40.1	(5.0)	19	37.8	(6.7)	18	1.68	-.46	.20	39.1	(7.0)	21	37.3	(6.9)	22	-.26	.60
• **Family Resource Scale (FRS)**[♣]	126.4	(22.6)	18	115.5	(16.1)	18	2.80	-.48	.10	129.4	(16.2)	20	118.2	(16.6)	20	-.69	.04
• **Family Index of Life Events (FILE)**[♠]	9.6	(5.8)	19	13.6	(6.0)	18	3.33	-.69	.08	9.8	(6.0)	21	12.3	(6.2)	22	-.42	.28
• **Family Support Scale (FSS)**[♣]	33.1	(11.5)	19	27.8	(9.0)	17	2.26	-.46	.14	34.4	(11.7)	21	28.9	(9.0)	22	-.47	.05

[♠] Statistical analysis and Effect Size (ES) for PSI and FILE were based on raw scores where low raw scores and positive ES are most desirable.

[♣] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[*] Statistical analysis for BDI scores was conducted using raw scores for each of the scales.

[+] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

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Selection of Covariates

The choice of covariates for the analysis procedures was conducted using three methods. First, demographic, contextual, and outcome variables in which groups differed at pretest were considered as possible covariates. They were used if their correlation with the outcome measure indicated that there was a sufficient relationship to adjust means to account for the pretreatment differences. If the correlation was insignificant, then the variable was not used as a covariate.

Second, in the case of child measures, raw scores were analyzed; thus, age was used as a covariate. This eliminated the need for age adjusted scores and developmental quotients which were not appropriately normed for samples with severe disabilities.

Finally, variables which correlated with the outcome variable to make at least a marginal increase in power were included as covariates. If two related variables made this list, then the most appropriate was chosen. The statistical overlap would serve to negate the attempted increase in power. In as many cases as possible, at least one demographic, one child functioning, and one family variable was used as covariates. This increase in power was included to demonstrate that even under the most liberal statistical conditions, differences were very hard to detect. In addition, this increase in power helped offset the loss of power due to attrition. For sample sizes obtained at the fourth reassessment, the power (i.e., the ability to detect differences) obtained to detect moderate effects (in this case, effect sizes of .50 or better) were approximately 45%. With covariates producing a multiple of $\underline{R}$ .70, as was the case for most of the child measures analysis, power increased to over 90%. Thus, despite the attrition, the ability to detect even moderate differences was substantial.

Reassessment Analyses for Year 1

Results of group comparisons on child outcome measures for Year 1 are presented in Table 2.9. Analysis of the data for the three measures of child functioning--BDI, Wisconsin, and Bayley Scales--indicated that there were no statistically significant differences between the groups in favor of the more intensive group after one year of intervention.

Table 2.9

Year 1 Reassessment Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	p Value
Average Length of Time between Pretest & Reassessment		10.7	(1.8)		31	10.4	(2.6)		29	0.21	.17	.65
Age in months at Reassessment		25.1	(6.3)		31	24.2	(7.3)		29	1.42	.14	.24
Battelle Developmental^ Inventory Raw Scores for:												
Personal/Social	1,2,3	50.5	(26.1)	52.7	31	49.0	(23.0)	46.9	29	6.24	-.22	.02
Adaptive Behavior	1,2,3	36.4	(17.3)	38.0	31	37.4	(14.5)	35.9	29	2.13	-.12	.15
Motor	1,2,3	54.7	(31.2)	57.4	31	52.1	(26.6)	49.4	29	5.23	-.26	.03
Communication	1,2,3	26.6	(13.3)	27.8	31	27.4	(11.8)	26.2	29	1.33	-.12	.25
Cognitive	1,2,3	22.6	(12.4)	23.7	31	23.7	(9.6)	22.6	29	1.10	-.09	.30
Total	1,2,3	190.9	(97.9)	199.6	31	189.7	(81.6)	181.0	29	6.41	-.19	.01
Bayley Scales^												
Mental	2,3,4	104.3	(51.9)	109.7	31	112.5	(38.3)	107.0	29	0.22	-.05	.64
Motor	2,3,5	46.2	(23.0)	47.6	31	47.2	(18.0)	45.8	29	0.82	-.08	.37
Wisconsin												
Deviation Score	3,6	.6	(.4)	.6	31	.7	(.3)	.7	29	0.30	.11	.59
Behavior Age	2,3,7	16.2	(10.6)	16.1	31	16.2	(9.5)	16.3	29	0.02	.02	.89

♦ 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Battelle cognitive raw score (pretest), 5 = Battelle total motor raw score (pretest), 6 = Wisconsin deviation score (pretest), 7 = Wisconsin behavior age score (pretest)

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

All of the effect sizes for child functioning as measured by the Battelle and the Bayley were negative. This indicated that across all domains, the less intensive group scored higher after adjusting for pretreatment differences and the age of each child. Additionally, three of these variables, including the total score on the Battelle, showed a statistically significant difference in favor of the basic group.

Results of the group comparisons for the family outcome measures for Year One are presented in Table 2.10. Statistically significant group differences were found on the Family Support Scale. Mother's FSS total score for adequacy of support was higher (p = .04) for the mothers in the expanded intervention than for those in the control group. This indicates that mothers who participated in services three times per week reported higher levels of helpfulness for available sources of support than did mothers who participated in services once per week. There were no statistically significant differences on any of the other family measures.

Table 2.10

Year 1 Reassessment Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates◆	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	p Value
• **Parenting Stress Index***												
Child	1,2,3	119.2	(20.6)	118.8	31	110.9	(22.8)	111.8	29	2.84	.34	.10
Parent	1,2,3	128.0	(26.5)	127.2	31	130.9	(35.5)	132.5	29	0.75	-.20	.39
Total	1,2,3	247.2	(40.5)	245.9	31	241.9	(52.6)	244.4	29	0.04	.04	.85
• **Family Adaptability and Cohesion Evaluation Scales III (FACES III) - Mother****												
Adaptability	4,6,7	22.9	(5.7)	23.2	31	23.2	(6.5)	22.3	29	0.50	.16	.48
Cohesion	5,6	38.7	(6.8)	38.9	31	39.3	(4.8)	38.8	29	0.01	.01	.92
• **Family Support Scale (FSS) - Mother**	6,8	26.9	(10.2)	26.3	31	29.8	(10.4)	30.6	29	4.40	.42	.04

◆ 1 = PSI Total (pretest), 2 = FILE (pretest), 3 = Ethnicity of child (Caucasian/non-Caucasian), 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Maternal age, 7 = Battelle total raw score (pretest), 8 = Family support scale (pretest)

* Lower scores on the Parent Stress Index are considered better.

** Raw scores for the FACES were used and higher scores are considered better.

Videotapes of parent/child interactions were obtained for 62 subjects at the first reassessment. EIRI contracted with several researchers who had developed scoring systems for such videotapes in order to have them independently analyzed (Kofi Marfo, Gerald Mahoney, and Dale Farran). This arrangement ensured that the tapes would be analyzed by people who were thoroughly familiar with the scoring system being used and were uninformed about the group membership of participating subjects.

The results of the Marfo analysis of the parent-child interaction are included in Table 2.11. Out of 35 variables tested, a statistically significant difference was found for only one--*Child Complies with Mother's Verbal Instruction.* This is no more than would be expected to be found by chance when so many variables are being tested. The results of the Farran and Mahoney analyses of the parent/child interaction tapes are included in Table 2.12 and 2.13, respectively. There were no

Table 2.11

Year 1 Reassessment Analyses for Videotapes of Parent/Child Interaction Analysis for SMA/Lake-McHenry

Variables	Low Intensity			High Intensity			ANCOVA F	p Value
	x̄	(SD)	n	x̄	(SD)	n		
• Parent verbal mand	4.1	(4.6)	26	3.9	(1.2)	25	.03	.87
• Parent nonverbal mand	.2	(.3)	26	.2	(.2)	25	.31	.58
• Parent verbal response	1.0	(.6)	26	1.1	(.4)	25	.49	.49
• Parent nonverbal response	.2	(.3)	26	.2	(.2)	25	.21	.64
• Parent verbal response mand	.2	(.3)	26	.2	(.1)	25	.16	.69
• Parent nonverbal response mand	.0	(.0)	26	.0	(.0)	25	2.19	.14
• Parent verbal unlinked	1.9	(1.1)	26	1.7	(.6)	25	.21	.65
• Parent nonverbal unlinked	1.3	(.7)	26	1.3	(.4)	25	.34	.56
• Child verbal mand	.1	(.3)	26	.1	(.2)	25	.12	.73
• Child nonverbal mand	.1	(.2)	26	.2	(.2)	25	1.09	.30
• Child verbal response	1.3	(3.9)	26	.5	(.8)	25	1.03	.31
• Child nonverbal response	1.8	(.9)	26	1.9	(.6)	25	.16	.69
• Child verbal response mand	.0	(.0)	26	.0	(.0)	25	.96	.33
• Child nonverbal response mand	.0	(.0)	26	.0	(.0)	25	--	--
• Child verbal unlinked	.0	(.1)	26	.0	(.0)	25	.01	.90
• Child nonverbal unlinked	1.4	(.7)	26	1.5	(.5)	25	.21	.65
• Parent initiates topic	.9	(.5)	26	.9	(.2)	25	.01	.91
• Parent follows topic	.3	(.4)	26	.4	(.2)	25	.18	.67
• Child follows topic	.7	(.5)	26	.7	(.2)	25	.00	.94
• Child initiates topic	.4	(.4)	26	.5	(.2)	25	1.27	.26
• Parent verbal inhibition	.1	(.1)	26	.1	(.1)	25	1.69	.20
• Parent nonverbal inhibition	.1	(.1)	26	.1	(.1)	25	.89	.35
• Parent intrusion (inadvertent)	.1	(.1)	26	.1	(.1)	25	1.41	.24
• Child complies with verbal inhibition	.0	(.1)	26	.1	(.1)	25	4.51	.04
• Child complies with nonverbal inhibition	.1	(.1)	26	.1	(.1)	25	3.04	.09
• Parent standard imperative	1.8	(.8)	26	2.2	(.7)	25	3.56	.06
• Parent embedded/implied directive	.6	(.7)	26	.7	(.4)	25	.11	.74
• Child complies with standard imperative	.9	(.4)	26	1.0	(.4)	25	1.25	.27
• Child complies with embedded/implied directive	.4	(.7)	26	.2	(.2)	25	.85	.36
• Parent labels	.4	(.2)	26	.4	(.2)	25	.06	.80
• Parent expands	.1	(.1)	26	.0	(.1)	25	.66	.42
• Parent gives information	.6	(.5)	26	.6	(.3)	25	.00	.97
• Parent requests information	1.5	(2.4)	26	1.2	(.7)	25	.29	.59
• Parent models	.7	(.3)	26	.8	(.5)	25	1.23	.27
• Parent reinforces	.4	(.3)	26	.3	(.3)	25	.07	.79

Table 2.12

Year 1 Reassessment Parent/Child Interaction Ratings by Farran for Alternative Intervention Groups for SMA/Lake McHenry

	Basic Intervention			Expanded Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	ANOVA F	P Value
AMOUNT								
1. Principal Involvement	2.9	(1.30)	21	3.2	(1.20)	18		
2. Verbal Involvement	3.5	(.68)	21	3.4	(.70)	18		
3. Responsiveness of Caregiver	3.2	(.81)	21	3.7	(.59)	18		
4. Play Interaction	3.6	(.92)	21	3.6	(.78)	18		
5. Teaching Behavior	1.2	(.44)	21	1.2	(.38)	18		
6. Control Activities	3.6	(.92)	21	3.7	(.90)	18		
7. Directiveness, Demands	2.8	(.89)	21	3.2	(1.00)	18		
8. Relationship Among Activities	3.9	(.77)	21	3.9	(.83)	18		
9. Positive Statements, Regard	2.2	(.99)	21	2.4	(.85)	18		
10. Negative Statements, Regard	1.9	(.89)	21	1.8	(.71)	18		
11. Goal Setting	1.6	(.92)	21	1.8	(1.00)	18		
12. Total for Amount	30.5	(3.78)	21	31.7	(4.80)	18	0.76	.39
QUALITY								
1. Physical Involvement	3.7	(.77)	17	3.9	(.75)	17		
2. Verbal Involvement	3.8	(.51)	21	3.9	(.73)	18		
3. Responsiveness of Caregiver	3.8	(.75)	21	3.9	(.68)	18		
4. Play Interaction	3.8	(.70)	21	3.8	(.73)	18		
5. Teaching Behavior	3.8	(1.30)	5	3.8	(.50)	4		
6. Control Activities	3.8	(.77)	21	3.8	(.88)	17		
7. Directiveness, Demands	3.9	(.64)	20	3.6	(.79)	17		
8. Relationship Among Activities	3.3	(.85)	21	3.5	(.79)	18		
9. Positive Statements, Regard	3.7	(.46)	15	4.0	(.63)	16		
10. Negative Statements, Regard	3.8	(.83)	18	3.4	(.79)	12		
11. Goal Setting	3.9	(.60)	9	3.6	(.70)	10		
12. Total for Quality	32.7	(5.50)	21	32.4	(8.90)	18	0.02	.89
APPROPRIATENESS								
1. Physical Involvement	4.1	(.43)	17	4.1	(1.20)	17		
2. Verbal Involvement	3.5	(.81)	21	3.7	(.58)	18		
3. Responsiveness of Caregiver	3.8	(.77)	21	3.6	(.62)	18		
4. Play Interaction	3.9	(.57)	21	3.9	(.83)	18		
5. Teaching Behavior	3.8	(.45)	5	4.0	(.82)	4		
6. Control Activities	3.6	(.75)	21	3.6	(.79)	17		
7. Directiveness, Demands	4.0	(.65)	20	3.9	(.56)	17		
8. Relationship Among Activities	3.3	(.72)	21	3.7	(.69)	18		
9. Positive Statements, Regard	4.3	(.59)	15	3.8	(.75)	16		
10. Negative Statements, Regard	3.8	(.73)	13	3.8	(.58)	12		
11. Goal Setting	4.0	(.71)	9	3.9	(.74)	10		
12. Total for Appropriateness	33.0	(5.40)	21	32.7	(8.80)	18	0.03	.87
GENERAL IMPRESSION								
1. Availability	4.2	(.83)	21	4.4	(.71)	18	1.16	.29
2. Acceptance	4.1	(.70)	21	3.9	(.90)	18	0.03	.86
3. Atmosphere	3.8	(.98)	21	3.6	(.70)	18	0.04	.83
4. Enjoyment	3.5	(.68)	21	3.8	(.88)	18	1.70	.20
5. Learning Environment	3.4	(.93)	21	3.5	(.86)	18	0.07	.79
AVERAGE RATINGS								
1. Amounts	2.8	(.34)	21	4.5	(6.9)	18	1.37	.25
2. Quality	3.7	(.52)	21	6.6	(11.9)	18	1.19	.28
3. Appropriateness	3.8	(.48)	20	4.9	(4.6)	18	1.16	.29
4. General Impression	3.8	(.67)	21	8.8	(21.3)	18	1.15	.29

Table 2.13

Year 1 Reassessment Parent/Child Interaction Ratings by Mahoney for Alternative Intervention Groups for SMA/Lake McHenry

	Basic Intervention			Expanded Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
Affect	3.31	(.69)	31	3.24	(.56)	31	.71	-.09
Child Orientation	3.17	(.91)	31	2.85	(.76)	31	.16	-.36
Performance Orientation	2.99	(.75)	31	3.12	(.48)	31	.51	.17

statistically significant differences between the groups on any of the variables coded in these analyses. Thus, it does not appear that there are meaningful differences at the first reassessment between the two groups in terms of parent/child interaction as rated by Marfo, Mahoney, and Farran.

Subgroup Analyses for Reassessment 1

To examine the relative effectiveness of once-per-week versus three-times-per-week services two subgroup analyses were conducted. The first of these excluded subjects with mild disabilities. The remaining subjects functioned at overall developmental levels more than two standard deviations below average. In the second subgroup analysis, only those children attending their respective programs more than two-thirds of the time were included. Although a variety of attendance rates would be expected in programs of this type, this subgrouping was done to examine a more direct comparison of one versus three times-per-week services. In both cases, the results were not very dissimilar from those using the full groups. All child measures were found to favor the basic group with some subdomains and, in the case of the attendance subgroup analysis, the total Battelle score and three subdomains being statistically significantly in favor of the less intensive group. Although differences were found in child related stress as measured by the PSI, the effect size for the full group analysis is not very different, and this apparent effect is not seen as dramatically in subsequent testing. Tables 2.14 to 2.17 show the results of the subgroup analyses.

Table 2.14

Year 1 Reassessment Measures of Child Functioning for SMA/Lake-McHenry Project (Excluding Subjects with Mild Disabilities)

		Basic Intervention				Expanded Intervention						
Variable	Covariates◆	$\bar{X}$	(SD)	Adj $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n	ANCOVA F	ES	P Value
Age in months at Reassessment			24.8	(5.9)	---	21	24.1	(5.2)	16	0.14	-.12	.71
Battelle Developmental^ Inventory Raw Scores for:												
Personal/Social	1,2,3,4	37.4	(18.5)	39.3	21	37.9	(14.4)	36.0	16	1.38	-.18	.25
Adaptive Behavior	1,2,3,4	28.0	(13.3)	29.6	21	29.9	(10.0)	28.3	16	0.47	-.10	.50
Motor	1,2,3,4	40.6	(26.4)	43.1	21	36.3	(17.8)	33.7	16	4.39	-.36	.04
Communication	1,2,3,4	19.7	(8.9)	20.8	21	21.8	(7.4)	20.7	16	0.00	-.01	.95
Cognitive	1,2,3,4	17.0	(10.0)	18.2	21	19.0	(6.3)	17.8	16	0.11	-.04	.74
Total	1,2,3,4	142.8	(73.9)	151.1	21	144.8	(50.0)	136.5	16	2.55	-.20	.12

◆ 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Number of people living in the home

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.15

Year 1 Reassessment Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry (Excluding Subjects with Mild Disabilities)

		Basic Intervention				Expanded Intervention						
Variable	Covariates◆	$\bar{X}$	(SD)	Adj $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n	ANCOVA F	ES	P Value
• **Parenting Stress Index***												
Child	1,2	123.5	(18.6)	123.0	21	112.4	(21.5)	112.9	16	3.36	.54	.08
Parent	3,9	131.8	(27.5)	128.9	21	126.6	(35.9)	129.4	16	0.00	-.02	.95
Total	1,2	255.3	(36.5)	250.2	21	239.0	(50.9)	244.1	16	0.26	.17	.62
• **Family Adaptability and** Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	4,6,7	21.0	(4.9)	21.6	21	23.8	(5.0)	23.2	16	0.85	.33	.36
Cohesion	5,3,6,7	38.0	(6.8)	38.2	21	39.1	(5.4)	38.9	16	0.12	.10	.74
• **Family Support Scale (FSS) - Mother**	8,3,6,7	27.3	(9.7)	27.7	21	29.2	(10.9)	28.9	16	0.24	.12	.63

◆ 1 = PSI Total (pretest), 2 = FILE (pretest), 3 = PSI Parent Related (pretest), 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Father living with child, 7 = Income, 8 = Family Support Scale (pretest)

* Lower scores on the Parent Stress Index are considered better.

** Raw scores for the FACES were used and higher scores are considered better.

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Table 2.16

Year 1 Reassessment Measures of Child Functioning for SMA/Lake-McHenry Project (Excluding Subjects with Low Attendance)

Variable	Covariates◆	Basic Intervention				Expanded Intervention				ANCOVA F	ES	p Value
		$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n			
Age in months at Reassessment		25.3	(6.0)	---	27	21.7	(5.6)	---	20	4.40	-.60	.04
Battelle Developmental^ Inventory Raw Scores for:												
Personal/Social	1,2,3,4	57.3	(25.1)	49.9	27	43.2	(15.9)	44.6	20	4.01	-.21	.05
Adaptive Behavior	1,2,3,4	37.4	(16.0)	36.7	27	34.0	(9.5)	34.7	20	1.52	-.13	.23
Motor	1,2,3,4	55.4	(29.3)	54.8	27	44.2	(19.3)	44.8	20	6.17	-.34	.02
Communication	1,2,3,4	27.6	(13.1)	27.2	27	24.6	(7.2)	25.0	20	2.80	-.17	.10
Cognitive	1,2,3,4	23.0	(11.6)	23.0	27	21.4	(5.5)	21.8	20	0.96	-.10	.33
Total	1,2,3,4	195.1	(92.8)	191.6	27	167.3	(51.9)	170.8	20	6.51	-.22	.02

◆ 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Number of people living in the home

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.17

Year 1 Reassessment Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry (Excluding Subjects with Low Attendance)

Variable	Covariates◆	Basic Intervention				Expanded Intervention				ANCOVA F	ES	p Value
		$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n			
• **Parenting Stress Index***												
Child	2,3	120.0	(21.1)	119.1	27	108.3	(16.1)	109.7	20	4.46	.45	.04
Parent	2,7	129.1	(23.8)	126.4	27	127.8	(37.1)	131.4	20	0.78	-.21	.38
Total	1,2	249.1	(38.2)	244.3	27	236.1	(47.4)	242.4	20	0.04	.05	.84
• **Family Adaptability and** Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	4,6	23.2	(6.0)	23.2	27	23.3	(4.5)	22.7	20	0.16	-.08	.69
Cohesion	5,6,7	39.3	(6.8)	39.8	27	38.9	(5.5)	38.1	20	1.21	-.25	.28
• **Family Support Scale (FSS) - Mother**	9,7,8	28.0	(10.0)	28.9	27	31.2	(10.2)	31.0	20	1.15	.21	.29

◆ 1 = PSI Total (pretest), 2 = FILE (pretest), 3 = PSI Child Related (pretest), 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Maternal age, 7 = PSI Parent Related (pretest), 8 = Occupation of father, 9 = Family Support Scale (pretest)

* Lower scores on the Parent Stress Index are considered better.

** Raw scores for the FACES were used and higher scores are considered better.

Reassessment Analyses for Year 2

For one subject in the expanded services group, the family declined to have the child complete the measures of child functioning, but did complete the family measures. The results of the analyses of the child functioning measures for the second reassessment for all other subjects are contained in Table 2.18. Once again, all the effect sizes on the Battelle favored the basic group with two subdomains approaching statistical significance ($p < .10$.).

Table 2.18

Year 2 Reassessment Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	p Value
Average length of time between Reassessments 1 and 2	---	12.9	(1.3)		28	12.6	(1.8)		21	0.79	.13	.38
Age in months at Reassessment 2	---	38.8	(6.4)		28	36.1	(6.7)		21	2.02	.43	.16
• **Battelle Developmental^ Inventory (BDI) raw scores for:**												
Personal/Social	1,2,3	78.0	(40.7)	79.3	28	74.4	(31.1)	73.1	20	1.79	-.15	.19
Adaptive Behavior	1,2,3	48.0	(25.2)	49.0	28	48.7	(18.4)	47.7	20	0.26	-.05	.61
Motor	1,2,3	62.1	(38.2)	64.3	28	63.0	(26.4)	60.7	20	0.50	-.09	.48
Communication	1,2,3	35.4	(23.2)	35.9	28	30.5	(16.8)	30.0	20	2.78	-.25	.10
Cognitive	1,2,3	28.5	(18.9)	28.8	28	24.8	(12.5)	24.5	20	2.62	-.23	.11
Total	1,2,3	252.0	(140.5)	257.3	28	241.4	(97.1)	236.0	20	2.28	-.15	.14
• **Scales of Independent Behavior:**												
Early Development Standard Score	3,4,5	54.1	(35.0)	53.8	27	53.6	(32.4)	53.8	20	.00	.00	.99

♦ 1 = Battelle total raw score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Battelle adaptive behavior raw score (pretest), 5 = Number of people living in the home

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

The results of the analyses of the second reassessment measures of family functioning are contained in Table 2.19. There was a statistically significant difference between the groups for Mother's Family Support Scale Score for adequacy of support. This is consistent with the findings for the first reassessment.

Table 2.19

Year 2 Reassessment Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
• **Parenting Stress Index***												
Child	1,2	121.6	(23.8)	121.8	28	114.3	(26.3)	114.1	21	2.16	.32	.15
Parent	1,2	132.1	(26.8)	131.0	28	135.1	(40.2)	136.2	21	0.52	-.19	.47
Total	1,2	253.7	(45.9)	252.8	28	249.4	(62.0)	250.3	21	0.06	.05	.81
• **Family Adaptability and** Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	3	20.9	(4.9)	21.1	28	19.5	(6.2)	19.3	21	1.26	.37	.27
Cohesion	2,4,5,7	37.8	(6.4)	37.9	28	38.2	(6.4)	38.0	21	0.00	-.02	.96
• **Family Support Scale (FSS) - Mother**	1,6	25.0	(9.1)	25.0	28	29.4	(10.7)	29.8	21	4.83	.53	.03
• **Comprehensive Evaluation of^ Family Functioning-Mother**												
Total Frequency	1,8	93.7	(27.9)	93.5	27	95.3	(19.8)	95.4	19	0.16	-.07	.69
Total Problems	1,8	7.3	(7.9)	7.5	26	8.1	(9.6)	7.8	19	0.03	-.04	.86
• **Comprehensive Evaluation of^ Family Functioning-Father**												
Total Frequency	1,8	91.4	(25.7)	93.1	18	96.1	(16.2)	94.4	16	0.06	-.05	.81
Total Problems	1,8	6.4	(6.9)	6.7	18	7.7	(9.6)	7.3	15	0.05	-.09	.82

♦ 1 = PSI Total (pretest), 2 = Maternal age, 3 = FACES Adaptability (pretest), 4 = FACES cohesion (pretest), 5 = Family resource scale (pretest), 6 = Family Support scale (pretest), 7 = PSI other related (pretest), 8 = Battelle total raw score (pretest)

* Lower scores on the Parent Stress Index are considered better.

** Raw scores for the FACES were used and higher scores are considered better.

^ Lower scores for Total Problems are considered better, while high scores on total frequency are considered better.

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Reassessment Analyses for Year 3

There were no statistically significant differences between the groups on any measures of child functioning (Table 2.20) in favor of the expanded services group at the third reassessment. Once again, all effect sizes were negative with three subdomains of the Battelle and the total score being statistically significantly in favor of the basic intervention group. On the measures of family functioning (Table 2.21), there was still a statistically significant difference on the Family Support Scale. There were no other statistically significant differences between the groups on any of the other family measures.

The data from the teacher questionnaire (Table 2.22) indicated that there were no statistically significant differences between the groups in terms of current educational placement on time spent in various types of classrooms. The data presented in this table indicate that the large majority of these subjects are currently receiving special education services, or more hours per day, in a self-contained special education classroom.

Table 2.20

Year #3 Reassessment Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	ES	P Value
• Time Between Reassessment #2 and #3		13.1	(2.0)	---	22	13.1	(1.7)	---	16	0.00	.00	.98
• Age in Months at Reassessment #3		53.1	(6.3)	---	22	49.4	(6.4)	---	16	3.16	-.59	.08
• **Battelle Developmental Inventory**^												
Raw Scores for:												
Personal/Social	1,2,3	98.4	(43.9)	99.2	22	81.3	(34.1)	80.6	16	6.11	-.42	.02
Adaptive Behavior	1,2,3	59.3	(27.8)	59.2	22	54.6	(19.9)	54.8	16	1.05	-.16	.31
Motor	1,2,3	82.5	(48.9)	81.9	22	78.2	(32.8)	78.8	16	0.20	-.06	.66
Communication	1,2,3	49.8	(29.8)	49.3	22	34.3	(18.4)	34.8	16	6.84	-.49	.01
Cognitive	1,2,3	43.9	(27.2)	43.2	22	32.8	(15.4)	33.4	16	5.28	-.36	.03
Total Score	1,2,3	334.0	(170.6)	332.8	22	281.2	(113.6)	282.4	16	4.47	-.30	.04
• **Child Behavior Checklist**												
T-Score - Internalizing	---	54.7	(8.3)	---	22	54.6	(9.2)	---	15	0.00	.01	.97
T-Score - Externalizing	---	48.5	(10.3)	---	22	51.9	(13.5)	---	15	0.76	-.33	.39
T-Score - Total Problems	---	50.6	(10.3)	---	22	52.5	(11.3)	---	15	0.28	-.18	.60

♦ 1 = Battelle total raw score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest).

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.21

Year #3 Reassessment Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake McHenry

Variable	Covariates♦	Basic Intervention $\bar{X}$	Basic Intervention (SD)	Basic Intervention Adj.$\bar{X}$	Basic Intervention n	Expanded Intervention $\bar{X}$	Expanded Intervention (SD)	Expanded Intervention Adj.$\bar{X}$	Expanded Intervention n	ANCOVA F	ES	p Value
• **Parenting Stress Index***												
Child	1,2,3	114.0	(24.0)	117.1	22	115.4	(30.1)	112.9	16	0.38	.18	.55
Parent	1,2,3	124.3	(24.2)	128.4	22	137.1	(44.2)	134.5	16	0.62	-.25	.44
Total	1,2,3	238.3	(45.9)	238.8	22	253.2	(68.1)	252.5	16	0.03	-.05	.85
• **FACES III - Mother****												
Adaptability	2,4	21.9	(4.1)	22.1	22	21.5	(6.9)	21.1	16	0.37	.24	.55
Cohesion	2,5	38.6	(7.4)	38.0	22	38.4	(6.0)	39.0	16	0.27	-.14	.61
• **Family Support Scale-Mother**	1,6	25.3	(11.3)	24.9	22	30.2	(11.6)	30.7	16	3.90	.51	.06
• **Comprehensive Evaluation of^ Family Functioning-Mother**												
Total Frequency	1	92.9	(17.6)	92.4	20	91.2	(26.3)	91.6	14	0.02	.05	.90
Total Problems	1	5.3	(6.9)	5.0	20	6.9	(9.7)	7.1	14	0.76	-.30	.39
• **Comprehensive Evaluation of^ Family Functioning-Father**												
Total Frequency	1	94.4	(16.3)	95.2	15	98.1	(15.1)	97.3	14	0.15	-.13	.70
Total Problems	1	5.8	(6.1)	5.9	15	4.9	(5.6)	4.6	14	0.41	.21	.53

♦ 1 = PSI total (pretest, 2 = FILE (pretest), 3 = Number of siblings receiving special education services, 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Family support scale (pretest)

* Lower scores on the Parent Stress Index are considered better.

** Raw scores for the FACES were used and higher scores are considered better.

^ Lower scores for Total Problems are considered better, while high scores on total frequency are considered better.

Table 2.22

Year #3 Reassessment Teacher Ratings and Parent Satisfaction Data for Alternative Intervention Groups for SMA/Lake McHenry

Variable	Basic Intervention $\bar{X}$	Basic Intervention (SD)	Basic Intervention n	Expanded Intervention $\bar{X}$	Expanded Intervention (SD)	Expanded Intervention n	ANOVA F	p Value	ES
• Percentage of subjects currently in special education	90		20	100		15		.45	.25
• Percentage with 90-100% Attendance♦	85		20	71		14		.37	-.30
• Teacher's recommendation for♦ placement for next year	1.9	(1.6)	18	1.6	(1.1)	15	0.73	.47	-.19
• Teacher ratings for 15 items♦	36.1	(5.3)	20	37.9	(4.5)	15	1.16	.29	.34
• # of months child has attended current program	16.6	(7.8)	18	14.4	(9.5)	15	0.51	.48	-.28
• # of Hours/Wk child attends current program	16.8	(9.9)	18	15.3	(7.9)	15	0.24	.63	-.15
• % of time per week child spends in regular class	7.5	(24.5)	20	4.0	(15.5)	15	0.24	.63	-.14
• % time per week child is in* self-contained class	82.4	(32.3)	20	92.4	(22.9)	14	0.98	.33	.31

♦ Higher scores for teacher recommendations indicate greater involvement in regular education program. Higher scores for teacher ratings indicate more desirable functioning.

* Lower percentage is considered better.

NOTE: Effect sizes from percentages were computed from a t statistic after an additional subject was added to each group in the comparison; those meeting the criteria and those that did not. This was done to ensure variance in group composition.

Reassessment Analysis for Year 4

Results from Year 4 testing were taken from an incomplete sample as indicated before. Results, however, do not disagree with previous years' results. Again, all differences between groups favored the basic services group on child functioning (Table 2.23). This reassessment, however, showed no statistically significant differences in any domain of the Battelle or its total. Statistically significant differences were found, however, on one subscale and the total score of the PSI (Table 2.24). This indicates that families of the expanded services group had lower overall stress and stress related to their daily lives and parenting roles.

Table 2.23

Year #4 Reassessment Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	ES	p Value
Age in months at Reassessment												
Battelle Developmental^ Inventory Raw Scores for:												
Personal/Social	1,2,3,4,5	115.7	(45.2)	112.7	20	105.2	(40.0)	105.8	18	0.35	-.15	.56
Adaptive Behavior	1,2,3,4,5	72.2	(29.0)	69.6	20	65.3	(23.9)	66.3	18	0.26	-.11	.61
Motor	1,2,3,4,5	96.9	(49.3)	95.0	20	90.5	(37.3)	89.3	18	0.29	-.12	.59
Communication	1,2,3,4,5	61.5	(32.6)	61.1	20	47.7	(24.2)	46.8	18	2.71	-.44	.11
Cognitive	1,2,3,4,5	56.8	(32.7)	55.8	20	43.4	(23.3)	42.8	18	2.57	-.40	.12
Total	1,2,3,4,5	403.4	(183.0)	394.3	20	352.1	(138.6)	351.0	18	1.14	-.24	.30

♦ 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 FILE (pretest), 5 = Number of people living in the home.

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.24

Year #4 Reassessment Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	ES	p Value
• **Parenting Stress Index***												
Child	1,2,3	109.1	(25.0)	116.2	17	108.5	(30.3)	102.8	16	2.34	.54	.14
Parent	1,2,3	122.5	(22.3)	132.3	17	126.8	(41.1)	118.4	16	3.69	.62	.07
Total	1,2,3	231.5	(42.7)	248.5	17	235.3	(68.0)	221.2	16	3.79	.64	.06
• **Family Adaptability and** Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	4,6	22.5	(5.0)	22.3	19	21.2	(5.4)	21.7	17	0.15	-.12	.71
Cohesion	5,7,6,8,2	40.6	(4.2)	38.9	19	39.4	(8.4)	40.6	17	0.83	.40	.37
• **Family Support Scale (FSS) - Mother**	9,2	30.4	(8.6)	28.7	19	28.8	(9.2)	30.7	17	0.42	.23	.52
• **Comprehensive Evaluation of^ Family Functioning—Mother**												
Total Frequency	1	91.8	(19.8)	94.0	16	88.8	(26.4)	86.6	17	0.92	-.37	.35
Total Problems	1	6.8	(7.5)	8.0	16	6.0	(10.3)	4.8	17	1.57	.43	.22

♦ 1 = PSI Total (pretest), 2 = FILE (pretest), 3 = Ethnicity of child (Caucasian/noncaucasian), 4 = FACES adaptability (pretest), 5 = FACES cohesion (pretest), 6 = Age of child at pretest, 7 = PSI other related (pretest), 8 = Family Resource Scale (pretest), 9 = Family support scale (pretest).

* Lower scores on the Parent Stress Index are considered better.

** Raw scores for the FACES were used and higher scores are considered better.

^ Lower scores for Total Problems are considered better, while high scores on Total frequency are considered better.

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Reassessment Analysis for Year #5

Results from Year 5 testing were taken from an incomplete sample. Results, however, do not disagree with previous years' results. Without exception, both in child and family functioning measures, analyses indicated that no statistically significant differences between groups existed. Tables 2.25 and 2.26 show the results of this analysis.

Table 2.25

Year #5 Reassessment Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake McHenry

Variable	Covariates♦	Basic Intervention				Expanded Intervention				ANCOVA	ES	p
		$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F		Value
Battelle Developmental^ Inventory Raw Scores for:												
Personal/Social	1,2,3,4	110.9	(54.9)	13.0	21	118.9	(51.8)	116.7	22	0.10	.07	.75
Adaptive Behavior	1,2,3,4	74.7	(32.8)	75.6	21	72.5	(30.8)	71.5	22	0.36	-.13	.55
Motor	1,2,3,4	101.3	(52.0)	105.8	21	97.2	(45.5)	92.7	22	1.37	-.25	.25
Communication	1,2,3,4	66.3	(40.2)	66.6	21	64.1	(36.2)	63.9	22	0.09	-.07	.77
Cognitive	1,2,3,4	59.5	(38.5)	60.5	21	60.0	(33.6)	59.0	22	0.03	-.04	.86
Total	1,2,3,4	412.7	(212.3)	421.6	21	412.6	(189.4)	403.8	22	0.17	-.08	.68
Social Skills Rating System (Teacher)^												
Social Skills	1,4	30.8	(14.6)	27.7	17	28.8	(14.2)	31.9	18	0.85	.29	.36
Problem Behaviors	56	9.4	(4.6)	9.7	16	11.1	(5.7)	10.7	17	0.22	-.22	.64
Academic Competence	1,2,4,6	26.7	(10.5)	26.1	18	26.7	(9.7)	27.3	18	0.14	.11	.71

♦ 1 = Battelle Total Raw Score (pretest), 2 = Age of child at pretest, 3 = PSI child related (pretest), 4 = Number of people living in the home, 5 = Family Resource Scale (Pretest), 6 = Maternal age

^ Statistical analysis for assessment instruments was conducted using raw scores for each of the scales.

Table 2.26

Year #5 Reassessment Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake McHenry

Variable	Covariates♦	Basic Intervention				Expanded Intervention				ANCOVA	ES	p
		$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F		Value
• **Family Support Scale (FSS) - Mother**	1,2	28.9	(9.6)	29.6	21	31.5	(9.2)	30.8	22	0.17	.13	.68
• **Comprehensive Evaluation of^ Family Functioning—Mother**												
Total Frequency	1,6	82.6	(32.3)	83.2	20	86.7	(26.6)	86.1	22	0.12	.09	.73
Total Problems	1	5.1	(7.3)	4.9	20	5.4	(7.7)	5.6	20	0.11	-.10	.74
• Parent Self-Awareness Scale	3,4,5	44.7	(6.8)	43.4	20	43.5	(8.6)	44.8	20	0.58	.21	.45

♦ 1 = PSI Total (pretest), 2 = Child age at pretest, 3 = FACES cohesion (pretest), 4 = Family resource scale (pretest, 5 = PSI other related (pretest), 6 = Battelle total raw score (pretest)

^ Lower scores for Total Problems are considered better, while high scores on Total Frequency are considered better.

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Conclusions

A few conclusions can be made about the relative effectiveness of once per week versus three times per week services given the longitudinal data presented for this population. First of all, it does not appear that increasing the number of service hours to three times a week has a significant effect on the skill development of a child with disabilities. Although there were three separate indices of the child's developmental level at Year 1, two indices at Year 2, 3 and 5, and one at Year 4, there were no statistically significant differences between the once-per-week and three-times-per-week groups on any of these measures in favor the expanded services group.

In fact, all differences in child functioning, with the exception of the Wisconsin at the first reassessment and one domain of the Battelle at the fifth reassessment, were in favor of the basic intervention group. This does not necessarily indicate that less intensive interventions are better, but with all the data suggesting that treatment was implemented as planned, and that groups remained comparable for all 5 reassessment analyses, it is fairly certain that this small increase in service intensity failed to produce detectable benefits in terms of child functioning.

The only benefit for families is the perception that they are receiving better support, which is worthwhile, but may not be worth an expenditure of approximately $6,500 per child per year. Even though the data from this study are clear, it should be noted that final decisions should not be made until other studies replicate these results. It is also important to note that this does not necessarily mean that more intensive interventions will not be more effective. There may well be a threshold which has not been achieved in this study. Perhaps instead of providing three hours of individualized intervention per week, 20 hours per week are necessary to achieve the types of benefits that would be measurable. Additionally, the hypothesis that the observed effects on parental support might generalize to more profound outcomes such as a maintenance of parental marital status and willingness of the family to continue to maintain the child in the home. Finally, measures of child functioning become more reliable as the subjects get older, and thus may reveal differences in school achievement or competence. Therefore, the longitudinal data to be collected in future years will be crucial in addressing these issues.

ARKANSAS INTENSITY STUDY

Project #3

COMPARISON: Children with Mild to Severe Disabilities--Home-based intervention once per week versus home-based intervention twice per week.

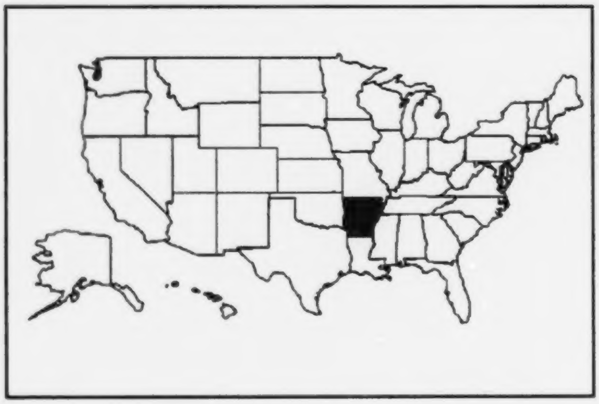
LOCAL CONTACT PERSONS: Lowell Collins, Coordinator (Sunshine Preschool)

EIRI COORDINATORS: William Eiserman and Lenore Shisler

LOCATION: Bentonville, Arkansas; and Fayetteville, Arkansas

DATE OF REPORT: 10-1-1992

Rationale for the Study



Limited evidence in the existing literature is available to guide programming decisions concerning the relative effectiveness of various intensities of early intervention (White & Casto, 1985). The frequency and intensity with which early intervention services are provided varies across program models based largely on philosophical orientation and professional judgment of individual child needs. Although home-based early intervention models are widely used, there is little empirical evidence upon which to make decisions regarding the effects of varying the frequency of home-based services. This study provides a comparison of the effectiveness of two levels of intensity of home-based services for children from birth to five years old.

Review of Related Research

Because of the passage of Public Law 99-457, state legislators and personnel in state educational, health, and social service agencies have devoted increased attention to providing educational and supportive services to birth to five-year-old children with disabilities and their families. One of the most frequent questions asked by those responsible for designing early intervention programs is how frequently services should be delivered. Most people associated with early intervention assume that more frequent services will result in greater benefits for participating children and their families (e.g., Bryant & Ramey, 1987; Dunst et al., 1989). Because more frequent services are likely to be more expensive; however, program administrators are hesitant to increase the frequency of services, unless there is evidence that such an increase will be beneficial for participating children and families.

Surprisingly, only a few studies have directly examined the issue of whether services that are delivered more frequently to children who are disabled will result in greater gains. Even more surprising is the fact that what little research has been done on this topic, particularly that which is methodologically well-designed and well-implemented, has yielded conclusions that are contrary to what most people expect. For example, Sandow and her colleagues compared a home visit program in which children with disabilities were visited two times per month versus the same program provided once every two months (Sandow & Clarke, 1978; Sandow, Clark, Cox, & Steward, 1981). Differences in cognitive functioning were not statistically significant after one, two, or three years. Similar findings of no differences for children who were motor impaired have been reported by Jenkins et al. (1982) who examined the effects of early intervention for a group of children who received three home visits per week and a group that was visited once per week (average effect size = .08); and by Law et al. (1991) who compared the effects of a three to one ratio of home visits and parent-delivered therapies (average effects size = 0.0).

For center-based early intervention programs with children who have disabilities, the results have been similar, but not as consistent. Taylor, White, and Pezzino (1984) and Barnett and Pezzino (1987) found no statistically significant differences in two studies which compared half-day versus full-day early intervention programs (average effect sizes for the two studies were .10 and -.11, respectively). Lovass (1987), on the other hand, reported substantial and statistically significant differences for a group of autistic children who received 40 hours per week of one-to-one services compared to another group of autistic children who received only 10 hours per week of intervention (average effect size = 1.41).

In summary, even though most people assume that children with disabilities who receive more frequent early intervention services will benefit (see, for example, reviews by Bryant & Ramey, 1987; Casto & Mastropieri, 1986; Dunst, et al., 1989; Horowitz & Paden, 1973; and White, Bush, & Casto, 1985-86), the research cited above, all of which is from well-designed studies, is very thin and usually yields findings that are contrary to expectations. (For a more extensive discussion of research on the effects of varying the intensity of early intervention, see Innocenti & White, 1992). The need for additional research on the relationship between frequency of intervention and outcomes, has been emphasized by virtually all who have worked in the area (e.g., Bailey & Simeonsson, 1988; Casto & Mastropieri, 1986; Jenkins et al., 1982; Law et al., 1991; White et al., 1985-86).

Overview of Study

Children and families in this study were randomly assigned to participate in either a standard or an expanded home-based level of intervention. Additional center-based services such as occupational, physical, and speech therapy were available to children in both groups and were provided with an intensity level approximately equal to the frequency of home-based services for each group. Expanded services were funded collaboratively (through the efforts of the service providers and EIRI) for the 1986-87 and 1987-88 academic years.

All children and parents completed a battery of tests (prior to, during, and following the interventions) that measured the child's developmental status, family demographics, parental stress, sources of support, and family adaptability and cohesion. Enrollment in the study was conducted during two academic years (1986-87 and 1987-88), resulting in two cohorts of participating subjects. Each cohort was subsequently administered reassessments at the following intervals: 8 months, 18 months, 30 months, 42 months, and 66 months following enrollment to intervention services (see Table 3.1). This report summarizes the first four reassessments and introduces the 66-month reassessment of the first cohort (the 66-month reassessment for the second cohort is scheduled for the spring of 1993).

Table 3.1

Number of Children Tested by Test Date, Group, Cohort, and Site

	Pretest Year		Reassessment Session				
	1986-1987	1987-1988	8-Month 1987-1988	18-month 1988-1989	30-Month 1989-1990	42-Month 1990-1991	66-Month* 1991-1992
COHORT #1							
Standard Service							
** Sunshine	22	--	20	16	15	19	25
Richardson	5	--	4	4	3	3	4
Expanded Service							
Sunshine	24	--	23	20	21	21	23
Richardson	7	--	5	7	6	6	6
Total Sunshine	46		43	36	36	40	37
Total Richardson	12		9	11	9	9	10
Cohort # 1	58		52	47	45	49	47
COHORT #2							
Standard Service							
Sunshine	--	6	2	3	3	2-	
Richardson	--	4	3	3	1	--	
Expanded Service							
Sunshine	--	7	7	5	5	3	
Richardson	--	3	3	3	2	3	
Total Sunshine		13	9	8	8	45	
Total Richardson		7	6	6	3	12	
Cohort # 2		20	15	14	11	8	

* The second cohort will receive the 66-month reassessment in Spring 1993.
** Services were provided by two early intervention centers; the Sunshine School and the Richardson Center.

Methods

Program Organization

At the time this study was conducted, the Sunshine Preschool and Richardson Center were funded under the Arkansas Developmental Disabilities Council to serve individuals with disabilities not being assisted by the public schools due to either age or severity of disability. The elements of the programs related to this research were administered by on site coordinators who managed the research. The Sunshine program served children from birth to school-age, and the Richardson Center served persons from birth to adulthood; at the preschool level, both centers had home-based programs for children birth to three and center-based programs for children three to five. The Sunshine program also provided home-based services to children three to five when transportation to the center could not be arranged. Both Sunshine and Richardson Centers had as their main service goal for preschoolers to develop functional, generalizable skills that enhanced development. Both centers transitioned some children into public school special education programs and continued to provide school-age services to the children with the most severe disabilities.

Prior to the initiation of the research, the Richardson Center program was entirely center-based, serving children on a schedule that was agreed upon by parents and center staff. Because of serious attendance problems, staff were not satisfied that the center-based delivery system was the most effective system available for serving these young children. They looked to the Sunshine Center as a model for home-based delivery. When the director of the Richardson Center decided to adopt a home-based model, she was invited to participate in the research. The staff at the Richardson Center were then trained and evaluated by the Sunshine Preschool coordinator. The Richardson Center had a staff of approximately 30 professionals and paraprofessionals. Two home-teachers, a speech therapist, and a physical therapist were involved in serving the children in the study.

With the help of staff at EIRI, funds were identified and obtained to enable the directors of both the Sunshine Preschool and the Richardson Center to offer twice-per-week home-based services on a short-term basis (two years) for a limited number of children. Without these funds, the standard level of once per week or once every other week would have been provided to all children.

Subjects

Subjects were from 3 to 48 months of age at time of enrollment and were eligible for early intervention services according to Arkansas Developmental Disabilities Division standards. Parents of each child who met the study criteria were invited to participate in either the standard frequency group (approximately 1 time per week) or the expanded intervention group (approximately 2 times per week) based upon a random assignment. Approximately 6% of the invited families declined to participate in the research and continued to receive the standard level of intervention.

Children qualified for participation in the research on the basis of their age, type, and severity of disability. Children were only enrolled in the research if they were eligible for at least one more academic year of early intervention prior to entering kindergarten. Since children were randomly assigned to treatments in this study, previously received interventions were balanced between the groups. All children were assessed using the Developmental Profile II (Alpern, Boll, & Shearer, 1980). Any children who could complete 75% of items at his/her age range were excluded from the study.

Recruitment. All families with children receiving services prior to the 1986-87 academic year, and all new referrals during that year and the Fall of the 1987-88 year were approached by personnel from the Benton County Sunshine Preschool or the Richardson Center for possible participation in the study. Of those approached, all but 5 (2 at the Sunshine program and 3 at the Richardson Center) agreed to participate. This represents a 94% (78 of 83) rate of participation.

Assignment to groups. A total of 78 children met the preceding criteria for inclusion in the study and were subsequently stratified into three age levels (birth to 20 months; 21 to 36 months; and 36 to 48 months) and three levels of disability (severe [< 25% of age level]; moderate [25 to 50% of age level]; and mild [51 to 75% of age level on the Developmental Profile]). Within each cell children were then randomly assigned to the standard or the expanded intervention group. A complete description of assignment procedures is provided in the 1987 Annual Report of the Early Intervention Effectiveness Institute.

Attrition. Sixty-seven children from both cohorts were reassessed 8 months after the pretest, 61 children after 18 months, 56 children after 30 months, and 57 children after 42 months (see Table 3.1). Forty-seven children from cohort 1 completed the 66-month reassessment in 1992. The number of children not participating at each reassessment and the reasons for non-participation are presented in Table 3.2. Parents who refused further participation in the study did so because their children were already receiving developmental assessments at school and because they were concerned that their children were being tested too much. One family at the Richardson Center refused because they felt the family measures were too intrusive. A major cause of attrition at the Sunshine Preschool was difficulty in locating families at the time of reassessment. These were primarily families that moved frequently and did not have telephones. One child at each site was placed in foster care and was therefore dropped from the study.

Table 3.2

Reasons for Subject Attrition by Reassessment

	Number of Subjects Lost*				
Reason	8-Month Reassessment	18-Month Reassessment	30-Month Reassessment	42-Month Reassessment	66-Month Reassessment
Parental Refusal	3	4	7	8	3
Discharged from EI services	1	1	1	1	0
Not Located	2	6	6	4	5
Missed Appointments**	3	2	4	4	1
Deceased	1	2	2	2	2
In & Out of Foster Care	1	2	2	2	0
Total	11	17	22	21	11

* N at pretest was 78, with 58 in cohort 1 and 20 in Cohort 2. Cohort 2 has been reassessed 3 times, and cohort 1 5 times.

** Children in this category missed at least 3 appointments for assessment.

Analyses of data (Table 3.3) on participating and non-participating families indicated six statistically significant group-by-status interactions out of the 47 tests which were completed ($p < .10$). Three of these were at the 30-month reassessment and three at the 42-month reassessment. No statistically significant group-by-status interactions were found at the 66-month posttest of cohort 1. Five of the six statistically significant interactions revealed dropout patterns that would favor the expanded intervention group. This type of bias is of greatest concern if the reassessment findings indicate differences in favor of the expanded intervention group since it would then be difficult to determine whether the differences were attributable to the intervention differences or to differential dropout. The fact that such differences have not appeared in the reassessment makes attrition less of a threat. Furthermore, the fact that those variables that are most directly related to child development outcomes (BDI pretest scores) do not reveal group-by-status interaction makes us more confident that attrition, although it was substantial, did not have a biasing effect on the results. Finally, most of those

Table 3.3

Attrition Data for the Arkansas Intensity Study

Variable		Standard			Expanded			ANOVA					
								Group		Study Status		Group by Status	
		$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	F	p	F	p	F	p
8-MONTH REASSESSMENT													
CA at pretest	IN OUT	27.5 23.4	(14.2) (15.1)	29 7	29.1 24.3	(12.9) (4.9)	38 4	.07	.79	.98	.32	.01	.93
BDI DQ	IN OUT	45.1 50.6	(25.6) (28.3)	29 7	54.8 60.4	(25.5) (14.0)	38 4	1.29	.26	.42	.52	.00	.99
Total PSI	IN OUT	248.3 236.4	(55.1) (45.8)	28 7	255.6 224.8	(49.5) (43.4)	35 4	.02	.90	.00	.99	.07	.79
FRS	IN OUT	115.8 117.9	(25.5) (25.1)	29 7	114.2 112.0	(20.5) (17.6)	37 4	.25	.62	.00	.99	.07	.79
FSS	IN OUT	29.4 27.9	(11.6) (7.2)	29 7	29.3 30.0	(12.4) (14.7)	38 4	.06	.80	.01	.91	.08	.78
Mother Education	IN OUT	11.6 12.9	(2.1) (2.6)	28 7	12.2 11.3	(2.2) (1.0)	38 4	.55	.46	.04	.84	2.09	.15
Father Education	IN OUT	11.7 12.5	(1.5) (2.7)	27 6	12.1 11.3	(2.4) 3.8	37 4	.31	.58	.01	.94	1.15	.29
Income	IN OUT	$15,339 $19,000	($9,470) ($10,731)	28 7	$17,868 $16,000	($10,842) ($7,506)	38 4	.00	.95	.07	.80	.64	.3
Number of Home Visits	IN OUT	29.14 14.29	(16.78) (8.40)	29 7	68.53 35.75	(32.28) (19.02)	38 4	12.58	.00	7.71	.01	1.09	.30
Percent Home Visits Attended	IN OUT	84.25 87.21	(15.04) (11.60)	29 7	82.29 78.78	(11.18) (7.13)	38 4	1.48	.23	.00	.95	.57	.45
18-MONTH REASSESSMENT													
CA at Pretest	IN OUT	27.5 24.6	(15.2) (14.8)	26 10	27.8 33.0	(11.3) (17.4)	35 7	1.35	.25	.09	.76	1.21	.28
BDI DQ	IN OUT	46.1 45.3	(25.4) (28.4)	25 10	53.4 64.9	(24.8) (22.6)	35 7	3.54	.06	.54	.47	.82	.37
Total PSI	IN OUT	243.7 251.4	(53.1) (55.1)	25 10	254.6 242.4	(45.1) (68.9)	32 7	.00	.97	.02	.89	.47	.49
FRS	IN OUT	115.5 118.0	(25.8) (24.1)	26 10	113.6 115.2	(18.7) (28.9)	35 6	.13	.72	.10	.76	.01	.94
FSS	IN OUT	30.8 24.7	(11.0) (9.5)	26 10	30.6 23.0	(13.1) (5.9)	35 7	.09	.77	4.59	.04	.05	.82
Mother Education	IN OUT	11.8 12.2	(2.1) (2.6)	26 9	11.9 13.1	(1.8) (3.3)	35 7	.67	.47	1.99	.16	.46	.50
Father Education	IN OUT	11.9 11.9	(1.4) (2.7)	26 7	12.2 11.3	(2.3) (3.6)	34 7	.04	.85	.52	.47	.46	.50
Income	IN OUT	$15,653 $17,278	($9,756) ($9,941)	26 9	$17,057 $20,857	($9,750) ($14,232)	35 7	.74	.39	.88	.35	.14	.71
Number of Home Visits	IN OUT	32.39 10.30	(15.40) (4.08)	26 10	70.49 40.00	(32.63) (17.81)	35 7	24.84	.00	14.94	.00	.38	.54
Percent Home Visits Attended	IN OUT	83.79 87.53	(15.29) (11.74)	26 10	81.96 81.96	(11.45) (7.79)	35 7	1.10	.30	.28	.60	.28	.60

(continued)

* Statistical analyses for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. A low score indicates low stress or a low number of stress-associated life events.

♦ Analyses for the FSS and FRS are based on raw scores indicating the amount of support or resources indicated by the family as being available. Higher scores are considered better.

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Table 3.3 (continued)

Attrition Data for the Arkansas Intensity Study

		Standard			Expanded			ANOVA					
								Group		Study Status		Group by Status	
Variable		$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	F	p	F	p	F	p
30-MONTH REASSESSMENT													
CA at pretest	IN	29.3	(15.3)	22	27.9	(12.5)	34	1.31	.26	.13	.72	2.47	.12
	OUT	22.6	(11.7)	14	32.0	(12.4)	8						
BDI DQ	IN	46.3	(26.3)	22	54.6	(26.2)	34	2.30	.13	.04	.84	.06	.81
	OUT	46.0	(26.0)	14	57.7	(17.2)	8						
Total PSI	IN	247.4	(50.8)	21	248.9	(47.6)	31	.78	.38	.25	.62	.60	.44
	OUT	243.6	(57.9)	14	266.9	(56.7	8						
FRS	IN	111.5	(26.7)	22	114.5	(20.2)	34	.69	.41	.46	.50	1.76	.19
	OUT	123.6	(21.0)	14	110.6	(20.5)	7						
FSS	IN	30.1	(11.5)	22	29.8	(12.9)	34	.00	.95	.62	.43	.00	.97
	OUT	27.6	(9.9)	14	27.5	(11.1)	8						
Mother Education	IN	11.3	(1.6)	22	12.1	(2.2)	34	.06	.81	1.00	.32	2.91	.09
	OUT	12.8	(2.8)	13	11.8	(1.9)	8						
Father Education	IN	11.5	(1.1)	22	12.3	(2.4)	33	.57	.45	.00	.98	4.91	.03
	OUT	12.7	(2.4)	11	11.0	(2.9)	8						
Income	IN	$13,227	($8,071)	22	$17,926	($10,985)	34	.01	.92	1.50	.22	2.89	.09
	OUT	$20,865	($10,570)	13	$16,668	($8,774)	8						
Number of Home Visits	IN	29.68	(16.86)	22	70.74	(33.12)	34	22.81	.00	7.80	.01	2.11	.15
	OUT	20.86	(15.11)	14	42.75	(17.95)	8						
Percent Home Visits Attended	IN	83.86	(15.78)	22	83.51	(8.19	34	3.04	.09	.75	.39	2.68	.11
	OUT	86.36	(12.11)	14	75.36	(17.66)	8						
42-MONTH REASSESSMENT													
CA at Pretest	IN	28.3	(15.4)	24	26.2	(11.0)	33	3.76	.08	1.00	.32	6.01	.02
	OUT	23.5	(11.7)	12	37.7	(15.4)	9						
BDI DQ	IN	48.2	(24.0)	24	55.9	(29.8)	33	2.63	.11	.11	.74	.35	.56
	OUT	42.1	(29.8)	12	56.6	(10.7)	9						
Total PSI	IN	253.4	(57.8)	23	249.8	(46.6)	31	1.19	.28	.04	.84	2.00	.16
	OUT	231.4	(40.4)	12	265.5	(60.5)	8						
FRS	IN	113.9	(25.9)	24	114.9	(20.8)	33	.74	.39	.02	.90	1.06	.31
	OUT	120.8	(23.5)	12	109.5	(17.3)	8						
FSS	IN	29.5	(12.4)	24	29.8	(12.6)	33	.00	.95	.30	.56	.02	.89
	OUT	28.5	(8.3)	12	27.7	(12.4)	9						
Mother Education	IN	11.3	(1.6)	24	12.5	(2.0)	33	1.59	.21	.01	.92	11.8	.00
	OUT	13.2	(2.8)	11	10.6	(2.3)	9						
Father Education	IN	11.5	(1.1)	23	12.3	(2.6)	32	.66	.42	.00	.99	5.39	.02
	OUT	12.8	(2.5)	12	11.0	(2.4)	9						
Income	IN	15312	(9145)	24	18242	(10783)	33	.03	.87	.00	.98	.87	.35
	OUT	17729	(11046)	11	15609	(9772)	9						
Number of Home Visits	IN	30.8	(17.5)	24	70.6	(31.6)	33	27.80	.00	8.40	.01	.66	.42
	OUT	17.2	(9.9)	12	46.3	(30.6)	9						

(continued)

* Statistical analyses for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. A low score indicates low stress or a low number of stress-associated life events.

♦ Analyses for the FSS and FRS are based on raw scores indicating the amount of support or resources indicated by the family as being available. Higher scores are considered better.

Table 3.3 (continued)

Attrition Data for the Arkansas Intensity Study

								ANOVA					
		Standard			Expanded			Group		Study Status		Group by Status	
Variable		x̄	(SD)	n	x̄	(SD)	n	F	p	F	p	F	p
66-MONTH REASSESSMENT*													
CA at pretest	IN	27.4	(15.0)	18	27.0	(12.5)	29	.10	.75	.31	.58	.15	.70
	OUT	22.0	(15.4)	9	26.0	(4.2)	2						
BDI DQ	IN	159.7	(108.5)	18	188.2	(83.4)	29	1.18	.28	.00	.95	.15	.70
	OUT	140.9	(119.6)	9	201.5	(87.0)	2						
Total PSI	IN	264.2	(40.1)	18	244.9	(44.6)	29	1.49	.23	6.16	.02	.06	.80
	OUT	219.8	(69.6)	9	190.5	(9.2)	2						
FRS	IN	111.4	(27.7)	18	114.8	(19.6)	29	.01	.93	2.33	.13	.07	.79
	OUT	128.1	(18.1)	9	126.5	(9.2)	2						
FSS	IN	30.4	(12.9)	18	31.0	(12.9)	29	.19	.66	.00	.96	.11	.74
	OUT	28.4	(9.6)	9	32.5	(17.7)	2						
Mother Education	IN	10.8	(1.6)	18	12.2	(2.2)	29	.03	.87	.48	.49	2.22	.14
	OUT	12.6	(2.1)	8	11.5	(7)	2						
Father Education	IN	11.3	(1.1)	18	12.0	(2.5)	28	1.16	.29	.65	.42	.11	.74
	OUT	11.7	(1.7)	7	13.0	(4.20	2						
Income	IN	27.8		18	41.4		29	.39	.54	.19	.66	.00	.98
	OUT	37.5		8	50.0		2						

* Attrition data reported for the 66-month reassessment includes only subjects in Cohort 1

**% with > $15,000 total household income

variables on which there were group-by-status interactions are only weakly correlated with outcomes in this study, which also reduces the threat of attrition as a confounding factor in interpreting the results.

Demographic characteristics. Pretest demographic data for subjects participating in each reassessment to date are presented in Table 3.4. Participating families were predominantly Caucasian and lived in predominantly rural areas. Family incomes ranged from less than $5,000 to $39,999, with 28% falling into the low SES category (below $10,000). The average number of years of education for parents was between 11 and 12 years for both groups. Of the 83 tests conducted comparing the two intervention groups, 17 were statistically significant (p < .10). Of those most clearly related to intervention effectiveness (e.g. mother's education, father's education, income, percent of children in daycare, percent of mothers who work outside the home, and the number of hours mothers work outside the home), all indicated higher means in the expanded intervention group. However, the correlations between these variables and both child and family outcomes were quite low. Nevertheless, these findings suggest a slight pretest difference between the

Table 3.4

Pretest Demographic Data for Subjects in the Arkansas Intensity Study

	8-Month Reassessment								18-Month Reassessment							
	Standard			Expanded					Standard			Expanded				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES
Child's age (in months)	27.5	(14.2)	29	29.1	(12.9)	38	.64	-.07	27.5	(14.2)	26	27.8	(11.3)	35	.95	-.13
Mother's age	32.5	(7.0)	27	32.4	(7.4)	38	.95	-.01	31.9	(7.0)	25	31.5	(7.0)	34	.81	-.06
Father's age	34.3	(7.6)	27	35.0	(8.4)	37	.74	.09	33.7	(7.9)	26	34.0	(8.0)	33	.87	.04
Mother's education	11.6	(2.1)	28	12.2	(2.2)	38	.34	.29	11.8	(2.1)	26	11.9	(1.8)	35	.87	.05
Father's education	11.7	(1.5)	27	12.1	(2.4)	37	.42	.27	11.9	(1.4)	26	12.2	(2.3)	34	.50	.21
Percent with both parents living at home	79.3		29	84.2		38	.62	.13	84.6		26	85.7		35	.91	.04
Hours per week mother employed	8.5	(16.0)	28	20.1	(21.4)	38	.01	.73	10.7	(17.3)	26	18.9	(18.8)	35	.08	.47
Hours per week father employed	33.6	(21.5)	27	39.5	(16.6)	37	.24	.27	36.5	(19.5)	26	39.3	(18.2)	34	.57	.14
Percent mothers who work outside of home	28.6		28	55.3		38	.02	-.51	30.8		26	57.1		35	.04	-.50
Percent fathers in technical/managerial positions	7.4		27	16.2		37	.28	.21	7.7		26	11.8		34	.60	.09
Total Household Income	$15,339	($9,470)	28	$17,868	($10,642)	38	.32	.27	$15,653	($9,756)	26	$17,057	($9,749)	35	.58	.14
Percent on public assistance	53.6		26	52.6		38	.94	.02	50.0		26	48.6		35	.91	.03
Mother as primary caregiver	62.8		29	81.6		38	.08	.42	84.6		26	80.0		35	.65	-.09
Percent in daycare > 5 hours per day	20.7		29	40.5		37	.15	-.39	23.1		26	42.7		35	.10	-.38
Number of siblings	1.5	(1.6)	28	1.2	(1.2)	38	.36	-.19	1.4	(1.3)	26	1.1	(1.1)	35	.40	-.23
Percent Male	62.1		29	63.2		38	.92	.02	61.5		26	57.1		35	.75	.08
Percent Caucasian	93.1		29	94.7		38	.74	.08	96.2		26	94.3		35	.88	.04

(continued)

$$\hat{ES} = \frac{\text{Expanded Intensity } x - \text{Standard Intensity } x}{\text{Standard Intensity SD}}$$

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Table 3.4 (continued)

Pretest Demographic Data for Subjects in the Arkansas Intensity Study

	30-Month Reassessment								42-Month Reassessment							
	Standard			Expanded					Standard			Expanded				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
Child's age (in months)	29.3	(15.3)	22	27.9	(12.5)	34	.71	-.24	28.3	(15.4)	24	26.2	(11.0)	33	.56	-.14
Mother's age	32.7	(7.4)	21	31.8	(7.0)	34	.66	-.12	33.8	(7.0)	23	33.1	(6.9)	33	.72	-.10
Father's age	33.9	(7.9)	22	34.2	(8.1)	33	.87	.04	35.6	(7.3)	23	35.4	(8.1)	32	.93	-.03
Mother's education	11.3	(1.6)	22	12.1	(2.2)	34	.11	.50	11.3	(1.6)	24	12.5	(2.0)	33	.02	.75
Father's education	11.5	(1.1)	22	12.3	(2.4)	33	.08	.73	11.5	(1.1)	23	12.3	(2.4)	32	.08	.73
Percent with both parents living at home	86.4		22	85.3		34	.91	.00	83.3		24	84.9		33	.88	.05
Hours per week mother employed	9.9	(17.4)	22	18.3	(18.7)	34	.09	.48	9.9	(16.9)	24	17.2	(18.9)	33	.13	.43
Hours per week father employed	33.3	(22.2)	22	38.8	(17.4)	33	.34	.25	35.8	(20.7)	23	39.2	(17.8)	32	.53	.16
Percent mothers who work outside of home	27.3		22	55.9		34	.03	-.54	29.2		24	57.5		33	.09	.54
Percent fathers in technical/managerial positions	0		22	15.2		33	.13	.40	4.4		23	15.6		32	.16	.28
Total Household Income	$13,227	($8,070)	22	$17,926	($10,986)	34	.07	.58	$15,313	($9,145)	24	$18,242	($10,783)	33	.27	.32
Percent on public assistance	54.6		22	52.9		34	.91	.03	45.8		24	57.6		33	.39	.22
Mother as primary caregiver	86.4		22	82.4		34	.69	-.07	83.3		24	81.8		33	.88	-.02
Percent in daycare > 5 hours per day	22.7		22	38.2		34	.22	-.29	20.8		24	36.4		33	.20	.30
Number of siblings	1.7	(1.7)	22	1.1	(1.2)	34	.21	-.35	1.7		24	1.1		33	.18	
Percent Male	68.2		22	61.8		34	.67	.11	58.3		24	57.6		33	.96	-.01
Percent Caucasian	95.5		22	94.1		34	.99	.00	95.8		24	93.9		33	.75	-.03

(continued)

$$\hat{ES} = \frac{\text{Expanded Intensity x - Standard Intensity x}}{\text{Standard Intensity SD}}$$

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Table 3.4 (continued)**

Pretest Demographic Data for Subjects in the Arkansas Intensity Study

	66-Month Reassessment							
	Standard			Expanded				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
Child's age (in months)	27.4	(14.9)	18	27.0	(12.5)	29	.93	-.03
Mother's age	27.6	(6.0)	17	29.1	(7.9)	29	.50	.25
Father's age	29.5	(7.1)	18	31.3	(9.2)	28	.44	.25
Father's education	11.3	(1.1)	18	12.0	(2.5)	28	.22	.64
Percent with both parents living at home	83.3		18	89.3		28	.59	.18
Hours per week mother employed	7.8	(16.0)	18	17.8	(19.4)	29	.06	.63
Hours per week father employed	33.5	(22.6)	18	39.0	(19.0)	28	.40	.24
Percent mothers who work outside of home	22.2		18	51.7		29	.04	.55
Percent fathers in technical/managerial positions	0		18	14.2		28	.22	.36
Total Household income*	27.8		18	41.4		29	.35	.24
Percent on public assistance	61.1		18	51.7		29	.54	-.17
Percent of Mother as primary caregiver	83.3		18	75.9		29	.54	-.13
Percent in daycare > 5 hours per day	0		18	34.5		29	.01	.75
Number of siblings	1.8	(1.6)	18	1.2	(1.1)	29	.14	-.37
Percent Male	66.7		18	58.6		29	.59	-.14
Percent Caucasian	94.4		18	93.1		29	.86	.01

$$\hat{ES} = \frac{\text{Expanded Intensity } x - \text{Standard Intensity } x}{\text{Standard Intensity SD}}$$

* % with > $15,000 total household income
**Data reported here include only subjects in Cohort 1

groups at pretest in favor of the expanded intervention group. Analysis of covariance procedures were used to adjust for these differences (Taylor & Innocenti, in press).

Intervention Programs

The expanded intervention was an extension of the standard service that was delivered prior to the initiation of the research. During the first year of the

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study, the intention was to provide services to the standard intensity group once every two weeks, and to the expanded intensity group twice per week, resulting in a 1:4 intensity comparison. In response to requests from the service providers to deliver services that more accurately reflected their preferred service model, the targeted level of services for the standard intensity group was increased to once per week during the second year of the study resulting in a 1:2 intensity difference. The ratio of the two interventions were comparable between each of the groups participating in the various reassessments (e.g. attrition did not cause the ratio to vary drastically) reflecting an average of 2.36 standard to expanded intervention ratio across the reassessment years.

Standard intervention group. The standard intensity group received home visits from trained paraprofessionals (mean rate of attendance was 87%). The preschool supervisor was responsible for training. As noted above, the intended frequency of home visits was once every other week during Year 1 and once per week during Year 2 of the study. The home teachers spent two weeks in individualized training, and were then closely supervised on their first home visits. Nine home teachers participated, two of whom had baccalaureate degrees, and all had extensive experience and background in early intervention. Three of the nine visitors had extensive experience with the severely disabled. The others had backgrounds of Early Childhood Education, as indicated in Table 3.5.

Motor and speech/language therapists provided individual therapy on a weekly basis to children whose evaluation data indicated a therapy need. The children were brought to the centers for their therapy, lasting approximately one-half hour. The home-based intervention took place primarily in the subject's home, although a small number of children were visited in daycare centers or at baby sitters. Home teachers focused on working with the children directly. The parents were expected to observe and demonstrate to the home visitor what they had learned. Home visits lasted approximately one hour.

An Individual Education Plan (IEP) was developed for each child and was used to guide the home visitor in working with the child and parent(s) during the sessions. The content of home visits was taken from the IEP, which was based on recommendations made by the multidisciplinary assessment team (typically including a psychologist, speech/language pathologist, OT/PT, home visitor, and the child's parent). Goals and objectives for the child were agreed upon by the home visitor and the parent, considering the parent's needs and the child's progress over time. A variety of assessment instruments and curricula were used to develop the objectives in the IEP. The IEPs were evaluated by the multidisciplinary team on a quarterly basis. All goals which had been achieved were recorded on a quarterly summary and shared with the multidisciplinary team. (During the site visit described below, 10% of the IEPs were randomly sampled for evaluation and were found to be age appropriate, developmental, and functional in nature.)

Intervention programs focusing on development of functional skills were provided by the home visitors and were individualized based on the child's developmental level and family's functioning. Typical goals included self-help (particularly feeding), gross motor, and communication skills. The primary care taker was required to demonstrate skill in positioning, feeding, and in 15 cases, medical technology such as oxygen, respirators, gavage feeding, and catheters. The home visitors were specially trained in these areas and helped parents meet the medical as well as developmental needs of their children. Children with less severe disabilities received programs focusing on their language, cognitive, self-help, and gross and fine motor needs.

Home visitors were assigned to children based on the children's level of functioning such that each visitor served approximately equal numbers of children in both groups. Table 3.5 indicates the number of children served by each visitor in each group. Each home visitor was observed at least two times annually during the years of intervention by the EIRI staff coordinator and consistently demonstrated

Table 3.5

Teacher Qualification and Original Assignments

Teacher	Education	Experience	# of Children in Standard	# of Children in Expanded
1	14 years	1 year	5	4
2	12 years	6 years	4	6
3	12 years	1 year	0	2
4	B.A.	2 years	7	6
5	M.A.	3 years	5	7
6	12 years	10 years	6	6
7	12+ years	1 year	4	5
8	12+ years	1 year	5	5
9	B.A.	2 years	0	1
TOTAL			***36***	***42***

knowledge, creativity, and sensitivity in dealing with young children with disabilities and their families. It is important to note that all but two of the teachers had nearly equal numbers of children in both groups, thus reducing the possibility of group differences resulting from differences between service providers.

Home visits included the following activities: warm-up play period, discussion of current concerns and child's status, direct 1:1 programming designed to meet specific objectives, work with the parents, discussion of progress made towards specific objectives, work with the parents, discussion of progress made towards objectives, and data recording. When ending the visit, the home visitor reminded the parent of the next visit and of any scheduled therapies; left data sheets, program descriptions, detailed instructions, and materials for the parent to use; and gave the parent encouragement for their efforts. Program data and anecdotal notes were recorded for each visit.

The curriculum was based on comprehensive assessments and a modification of the Learning Accomplishment Profile. The home visitor brought a variety of materials and toys for programs and the child's folder for recording data. She worked individually with the child, keeping data on 4 to 6 goal areas. Every attempt was made to involve the parents in the activities. For example, the home visitor might demonstrate how to position a child for feeding and provide direct modeling, shaping, prompting, and positive reinforcement to the parent. Once the visitor had instructed the parent on how to carry out the activity, a schedule was set up for the parent to follow. The amount of time a parent was expected to spend with the child depended on the child's needs and the parent's willingness and ability.

Home visitors created data recording sheets for parents that included the following: (1) a specification of the activities to be conducted; (2) spaces to record data and duration of activity; and (3) spaces to record correct responses and errors, as well as progress made towards the objective. For example, in a feeding program, the key data recorded would be that the child consumed two ounces orally. In some cases, however, the only record made by parents was whether or not the activity took place or if the activity was successful.

Home visitors kept detailed data on number of trials, correct and error rates, and a specified description of what progress took place toward each objective addressed. Anecdotal records described the session, the parent and child response, and plans for the next session.

Expanded intensity group. The expanded intervention group received exactly the same type of service delivery (mean rate of attendance was 84%) as the standard intervention group, but with at least double the frequency of home visits.

Treatment Verification

Intervention implementation. A number of procedures were used to verify that the two interventions were being implemented as intended. The EIRI coordinator communicated on at least a weekly basis with the on-site coordinator, assisted in areas of program development and child-find efforts, and made periodic site visits. The site was visited three times during the 1987-1988 year by the EIRI site coordinator. Other program verification activities included the following:

1. ***Collection of attendance data***. The child's participation in the program for both groups was recorded according to the length of the session and the staff involved. Non-attendance at regularly scheduled sessions was also recorded according to the reason for non-attendance. Analysis of attendance data indicated that the rates of attendance at home visits were nearly equal across the two groups during the two intervention years (1986-88).

2. ***Data describing the level of parent involvement***. Home teachers rated parents in three areas: attendance (in IEP meetings, therapy, home visits), knowledge regarding their child and their rights, and support activities (follow through, communication with staff, form completion, etc.). Parents were rated on each area with a 3-point scale, 1 = low, 2 = average, 3 = high. Table 3.6 contains the results of the teachers' ratings of parent involvement for the two years of the intervention implementation. Although no statistically significant differences were found between the standard and expanded intervention groups, fairly large effect sizes (Mean = .37) were found which indicated that the teachers rated parents in the expanded group as more involved than those in the standard group.

Table 3.6

Teacher Ratings of Parent Involvement* in the Home Visit Program

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	$\hat{ES}$
8-MONTH REASSESSMENT								
Attendance at visits and other activities	2.1	(.8)	29	2.3	(.7)	38	.24	.28
Knowledge/Understanding of child's program	1.9	(.9)	29	2.2	(.8)	38	.16	.33
Support of the child's program/activities	1.7	(.8)	29	2.1	(.8)	38	.05	.51
18-MONTH REASSESSMENT								
Attendance at visits and other activities	2.1	(.8)	26	2.2	(.7)	33	.62	.12
Knowledge/Understanding of child's program	2.0	(.8)	26	2.1	(.8)	33	.54	.16
Support of the Child's Program/Activities	1.8	(.8)	26	2.0	(.8)	33	.22	.34

$$\hat{ES} = \frac{\text{Expanded Intensity } x - \text{Standard Intensity } x}{\text{Standard Intensity SD}}$$

*1 = Some involvement; 2 = Moderate Involvement; 3 = High Involvement

3. ***Teacher evaluations***. The preschool supervisor evaluated teachers using two scales developed by EIRI staff. One was a 3-point scale (2 = criteria fully met; 1 = partially met; 0 = not met) that addressed five areas: teacher assessment skills, IEP development skills, IEP implementation skills, presentation of instruction, and instructional environment. The

second assessed six teacher traits (teaching skills, problem solving, work habits, relationships, communication skills, and attitude) on a 5-point scale (5 = outstanding, 4 = very good, 3 = good, 2 = needs improvement, and 1 = inadequate). Thus, the minimum possible score was 6 and the maximum possible score was 40. Actual teacher rating totals ranged from 21 to 40. Although there were some differences among teachers, the fact that teachers had children in each group means that these differences did not bias the results of the study.

4. ***Parent Satisfaction Data***. Parents completed a seven-item Satisfaction with Services Form to assess the degree to which parents in each group were satisfied with the services they received. Table 3.7 includes that parent satisfaction data collected during the intervention years. No statistically significant differences were found between groups in any of the areas addressed, but three effect sizes greater than .30 were found. The expanded group tended to feel better in all areas except one, but both groups reported satisfaction in all areas. Additionally, there is a statistically significant correlation between parent satisfaction data and teacher ratings of parent involvement. This relationship is particularly strong between parent ratings of satisfaction with the opportunities they were given to participate in the development and implementation of their child's program. This suggests that the more parents were involved in their child's program, the more satisfied they were. The fact that satisfaction was measured on a 4-point scale and all means are above 3 suggests that parents in both groups were very satisfied.

Table 3.7

Parent Ratings of the Quality of the Home Visit Program*

	Less Intensive			More Intensive				
Study Year	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
8-MONTH REASSESSMENT								
Program Staff	3.82	(.39)	28	3.88	(.33)	34	.51	.15
Communication with staff	3.71	(.46)	28	3.59	(.61)	34	.36	-.26
Program Goals	3.54	(.58)	28	3.68	(.54)	34	.33	.24
Participation	3.54	(.69)	28	3.59	(.61)	34	.76	.07
Range of Services	3.36	(.62)	28	3.47	(.66)	34	.49	.18
Child Progress	3.10	(1.17)	28	3.44	(.89)	34	.22	.29
Overall	3.18	(1.20)	28	3.59	(.9)	34	.10	.34
18-MONTH REASSESSMENT								
Program Staff	3.80	(.41)	25	3.86	(.35)	29	.56	.15
Communication with staff	3.76	(.44)	25	3.52	(.63)	29	.10	-.55
Program Goals	3.56	(.58)	25	3.62	(.56)	29	.70	.01
Participation	3.56	(.71)	25	3.55	(.63)	29	.96	.01
Range of services	3.40	(.65)	25	3.41	(.68)	29	.94	.02
Child Progress	3.08	(1.22)	25	3.34	(.94)	29	.38	.21
Overall	3.16	(1.18)	25	3.51	(.74)	29	.20	.30

$$\hat{ES} = \frac{\text{Expanded Intensity } x - \text{Standard Intensity } x}{\text{Standard Intensity SD}}$$

* Ratings ranged from 1 = Poor to 4 = Excellent.

5. ***Site Review***. Formal site reviews were conducted at the end of each treatment year as a part of a continuous effort to verify that treatment was taking place as planned. The EIRI Site Coordinator met with both Richardson and Sunshine Coordinators as well as with parents, ancillary staff, and all home teachers. In addition, the EIRI Site Coordinator attended a sample of home visits to observe each teacher at work. Results of the site reviews indicated that the program was well administered and that each intervention was implemented as intended. The program files were in good order, containing up-to-date IEPs, quarterly reports of progress, assessment information, and description of services received. Randomly selected IEPs were reviewed, and all were found to contain the following: (1) a statement of current level of performance (both norm and criterion referenced); (2) annual goals and short-term objectives that were functional, appropriate, and individualized; (3) evaluation of criteria for determining when the objectives were met; and (4) timelines for monitoring.

Cost of alternative interventions. The cost of delivering the intervention programs described above was determined using the ingredients approach (Levin, 1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are from the 1987-88 fiscal year (July to June) and are expressed in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988).

Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, travel, materials and supplies, miscellaneous and contributed resources. Total costs in each resource category for both programs were first added together and then prorated according to program intensity: 60% of resources were consumed by the high-intensity program and 40% by the low-intensity program. Allocation is based on total number of child visits to the high-intensity program as contrasted with the total low-intensity child visits out of the total number of visits to both programs. Cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each group. Table 3.8 presents the cost per child in each of these resource categories.

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to the program. Occupancy charges were based upon the replacement value of the facilities in which the programs were housed, annualized to account for interest and depreciation, and included all utilities, insurance, and maintenance costs. Equipment costs were based on the market replacement value of office furniture and equipment used by the program and also included equipment repair. Equipment cost, such as facilities, was annualized to account for interest and depreciation. Staff transportation costs for home visits and other job-related travel were reimbursed by Sunshine Preschool and Richardson Center at the rate of $.23 per mile and $.22 per mile, respectively. The cost for materials, supplies, and miscellaneous included the annual expense for all consumable items and miscellaneous expenses incurred by each program.

Table 3.8

Cost Per Child for Sunshine School/Richardson Center

Resources	Expanded Intensity	Standard Intensity
Agency Personnel:		
Direct Service	$ 4,336	$2,169
Administrative	1,658	828
Facilities	561	281
Equipment	118	59
Materials/Supplies	244	121
Staff Transportation	395	198
Miscellaneous	807	403
Subtotal	**$ 8,118**	**$4,059**
Contributed Resources:		
Parent time	927	610
Parent Travel	332	166
Volunteer	32	16
Subtotal	**$ 1,291**	**$ 792**
TOTAL	**$ 9,409**	**$4,851**

Totals may not add up due to rounding errors

Contributed resources included the value of volunteer and parent time. Community members contributed 144 hours during the year to the programs. Parents in the high-intensity group spent an average of 58.1 hours in home visit sessions and an average of 33.89 hours in therapy sessions. Parents in the lower intensity group spent an average of 30.8 hours in home visits and 29.7 hours in therapy sessions. Parents were interviewed via telephone to determine the time and out-of-pocket expenses incurred getting their children to the center for therapy sessions. All parent and volunteer time in the program was assigned the opportunity cost of $9 per hour, and mileage was estimated at $.21 per mile.

Data Collection

Data concerning child and family functioning were collected at enrollment and annually thereafter. Testing procedures are presented below.

Recruitment, training, and monitoring of diagnosticians. During the pretest and the 8-, 18-, 30- and 42-month reassessment years, three diagnosticians and a local assessment supervisor who had been trained and certified by EIRI standards were responsible for completing the testing. None were employed by either service provider, and testing assignments were made by the assessment supervisor to ensure that all diagnosticians were unaware of subjects' group placement. The diagnosticians possessed master's degrees in psychology, and the supervisor had a doctoral degree. The assessment supervisor was responsible for shadow scoring 10% of each diagnostician's test administrations, scheduling testing, and collecting, reviewing, and sending all protocols to the EIRI site coordinator. Interrater reliability for the shadow scored Battelle Developmental Inventories were calculated by dividing the number of agreements by the total number of items administered. Reliability coefficients averaged .95 (range .80 to 1.00).

For the 66-month reassessment of cohort 1, it was necessary to locate three additional diagnosticians to work with two of the diagnosticians who had tested during the previous reassessment. All five had extensive experience working with children who have developmental disabilities. In addition, four of the five diagnosticians had Master's degrees in fields related to special education, while one had completed graduate courses toward a Master's degree. All diagnosticians were trained to administer the child and family measures and were certified according to established EIRI standards. During the course of the assessment, 10% of test administrations were shadow scored by a second diagnostician and the mean interrater reliability coefficient for the Woodcock-Johnson Tests of Achievement-Revised and the Scales of Independent Behavior (two of the main child functioning measures used for the 66-month reassessment) exceeded .98. One of the most experienced diagnosticians also served as the assessment coordinator and reviewed all completed protocols before forwarding them to EIRI.

Testing. Parents of each child participating in the study signed an informed consent form and provided demographic information. At the pretest, children were administered the Battelle Developmental Inventory, and parents completed the Parenting Stress Index (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III). Parents were paid a $20 incentive at pretest, $30 at 8-month reassessment, and $50 at subsequent reassessments. The schedule for test administration is presented in Table 3.9 and includes descriptions of several additional measures which were included for the first time at the 66-month reassessment. Due to the maturation of the subjects, several new child functioning measures (the Woodcock-Johnson Test of Achievement-Revised [W-J], the Scales of Independent Behavior [SIB], the Social Skills Rating Scale, and the Inferred Self-Concept Scale) were introduced at the 66-month reassessment to replace the Battelle Developmental Inventory (BDI), Sequenced Inventory of Communication Development, and the Vineland Adaptive Behavior Scales--Survey Edition. It should be noted that while the SIB was completed on all subjects, four subjects in the standard group and six subjects in the expanded group, all from cohort 1, could not obtain basal scores on the W-J at the 66-month reassessment. The inverse problem would have been found for even more subjects if the BDI had continued to be used.

Most of the standardized measures described in Table 3.9 were used as outcome measures of child or family functioning. It was believed that intervention services would impact stress by helping families be more effective in dealing with their children with disabilities. Services were also believed to impact family adaptability and cohesion by teaching strategies for rearing children with

Table 3.9

Description of Child and Family Measures and Schedule of Administration

MEASURES	DESCRIPTION	ASSESSMENT	8-Month REASSESSMENT	18-Month REASSESSMENT	30-Month REASSESSMENT	42-Month REASSESSMENT	66-Month REASSESSMENT
Family Adaptability and Cohesion Evaluation Scale--(FACES III) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations.	x	x	x	x	x	
Additional Services (E.I.R.I)	Provides data on services the child and family have received during the past year outside the study (e.g., School, Early Intervention, Speech Therapy, Physical and Occupational Therapy, Tutoring).		x	x	x	x	x
Parent Self-Awareness Scale (PSAS) (Snyder, Weeldreyer, Dunst, & Cooper, 1985)	The PSAS is a 20-item questionnaire that measures the parent's perceived level of personal capabilities, decision-making capabilities, and informational capabilities.						x
Social Readjustment Rating Scale (SRRS) (Holmes & Rahe, 1967)	The SRRS measures parental stress by assigning numerical values to various positive and negative life events occurring within the last year. A separate score of the occurrence of major negative events is also provided.						x
Teacher Rating of Parent's Participation in Education Program (E.I.R.I.)	Assesses parental support/participation and knowledge of the child's educational program.						x
Battelle Developmental Inventory (BDI) (Newborg et al., 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.	x	x	x	x	x	
Sequenced Inventory of Communication Development (SICD) (Hedrick, Prather, & Tobin, 1984)	A measure of communication skills for children from birth to 48 months of age. Includes receptive and expressive communication domains.		x	x	x		

(continued)

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Table 3.9 (continued)

Description of Child and Family Measures and Schedule of Administration

MEASURES	DESCRIPTION	ASSESSMENT	8-Month REASSESSMENT	18-Month REASSESSMENT	30-Month REASSESSMENT	42-Month REASSESSMENT	66-Month REASSESSMENT
The Vineland Adaptive Behavior Scales--Survey Edition (Sparrow, Balla, & Cicchetti, 1984)	This version provides a general assessment of adaptive behavior, covering the domains of communication, daily living skills, socialization, and motor skills. It is administered to a parent or caregiver in a semistructured interview format. It is appropriate for use with persons ages birth to adult. Standard scores and age equivalents are obtainable. Norms for special populations (i.e., visually impaired) are also provided. Interrater reliabilities, internal consistencies, and concurrent validity data strongly support its use.		x	x	x	x	
Child Health (E.I.R.I.)	Assesses the parent's evaluation of the child's health during the past year, including general health, illnesses, hospitalization, etc.		x	x	x	x	x
Woodcock-Johnson Tests of Achievement--Revised (WJ-R) (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of six aspects of scholastic achievement: Letter-Word Identification, Applied Problems, Dictation, Science, Social Studies, and Humanities. Child is the respondent.						x
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1985)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: Motor Skills, Social and Communication Skills, Personal Living Skills, and Community Living Skills. Parent is interviewed for information.						x
Social Skills Rating System--Parent Form (PSSRS) (Gresham & Elliot, 1990)	The PSSRS measures the parent's estimate of the child's social skills such as: Control, Assertion, Responsibility, and Self-Control. Problem behaviors that are also assessed are: Externalizing, Internalizing, and Hyperactivity.						x
Social Skills Rating System --Teacher Form (TSSRS) (Gresham & Elliot, 1990)	The TSSRS measures the teacher's estimate of the child's social skills such as: Control, Assertion, and Self-Control. Ratings of problem behaviors (Externalizing, Internalizing, and Hyperactivity) and academic competence are also assessed.						x
Inferred Self-Concept Scale (ISCS) (McDaniel, 1973)	Assesses the subject's self-esteem base don observed behavior. Consists of 30 statements about student behavior that the teacher rates on a 5-point scale to provide a total inferred self-concept score.						x

(continued)

Table 3.9 (continued)

Description of Child and Family Measures and Schedule of Administration

MEASURES	DESCRIPTION	ASSESSMENT	8-Month REASSESSMENT	18-Month REASSESSMENT	30-Month REASSESSMENT	42-Month REASSESSMENT	66-Month REASSESSMENT
Parenting Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors.	x	x	x	x	x	
Parenting Stress Index (PSI) Short Form (Abidin, 1990)	Abbreviated version of the 1983 PSI with a total of 36 items.						x
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided perceived as helpful to families rearing young children.	x	x	x	x	x	x
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.	x	x	x	x	x	x
Family Inventory of Life events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: Intra-Family, Marital, Pregnancy and Childbearing, Finance and Business, Work-Family Transitions, Illness and Family "Care," Losses, Transitions "In and Out," and Legal.	x	x	x	x	x	

disabilities that would facilitate changes in the patterns of interaction between spouses/mates and other children in the home. It was found that more cohesive families (as measured by the FACES) and those with more resources (as measured by the FRS) tended to report lower levels of stress. Thus, the FACES was considered as an outcome variable. The FRS and the FSS were used as contextual variables because they elicited descriptions of the resources and support available to the families, variables which may have influenced the effectiveness of the two interventions examined in this study. The FILE was considered a contextual variable because the events it records have both theoretical and data driven relationships with stress among families of children with disabilities. At the 66-month reassessment the Social Readjustment Rating Scale (SRRS) replaced the FILE due to criticisms from families regarding the intrusiveness of some of the items of the FILE. The SRRS examines similar constructs including stress associated with significant life events.

Results and Discussion

Comparability of Groups on Pretest Measures

Pretest data from child and family measures appear in Table 3.10. As can be seen, Table 3.10 summarizes pretest data in five consecutive groups, each representing the pretest comparisons for subjects included in each reassessment. No statistically significant pretest differences were found in any BDI domain, although the expanded group performed at higher DQ levels in all domains. Family measures revealed no statistically significant pretest differences with the exception of a difference favoring the expanded group, found on the pretest child related score of the PSI for cohort 1 at the 66-month reassessment. Pretest differences were also found on some of the demographic characteristics, as can be seen in Table 3.4. Mothers' occupational status, hours per week mothers were employed, maternal education, and the percentage of children in daycare were all higher among the expanded group, although the statistical significance of the differences varied

Table 3.10

Pretest Data for Children and Families in the Arkansas Intensity Study

	8-Month Reassessment										18-Month Reassessment									
	Standard				Expanded						Standard				Expanded					
Variable	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	p Value	ES^	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	p Value	ES^
Battelle Developmental* Inventory (BDI)																				
Personal/Social	45.1	(24.8)		29	53.3	(23.7)		38	.18	.33	46.2	(24.4)		26	51.5	(24.4)		35	.38	.22
Adaptive Behavior	33.5	(20.2)		29	40.1	(17.4)		38	.16	.33	34.8	(20.6)		26	38.3	(15.7)		35	.47	.17
Motor	45.2	(35.4)		29	54.6	(28.4)		38	.25	.27	44.9	(35.3)		26	50.9	(26.6)		35	.47	.17
Communication	22.4	(16.3)		29	26.7	(13.2)		38	.29	.26	23.1	(16.1)		26	25.1	(12.4)		35	.61	.12
Cognitive	19.2	(13.8)		29	22.2	(9.2)		38	.32	.22	19.2	(13.6)		26	21.5	(9.1)		35	.45	.17
TOTAL	165.2	(106.4)		29	196.4	(87.5)		38	.20	.29	168.2	(106.4)		26	187.4	(80.6)		35	.44	.18
Parent Stress Index** (PSI)																				
Child Related	121.3	(27.8)	89	28	120.4	(23.8)	88	35	.89	.03	118.8	(28.2)	87	25	120.0	(22.2)	88	32	.86	-.04
Other Related	127.0	(32.3)	61	28	135.2	(30.5)	73	35	.31	-.25	124.9	(30.3)	58	25	134.6	(28.7)	73	32	.23	-.32
TOTAL	248.3	(55.1)	78	28	255.6	(49.5)	84	35	.59	-.13	243.7	(53.1)	75	25	254.8	(45.1)	83	32	.42	-.21
Family Adaptation and Cohesion Evaluation Scales (FACES)																				
Adaptation	23.3	(7.3)		29	21.8	(5.4)		36	.35	-.21	23.9	(7.4)		26	21.6	(5.5)		36	.95	-.31
Cohesion	39.7	(7.0)		29	39.1	(5.3)		36	.71	-.09	40.4	(7.1)		26	39.2	(5.5)		33	.19	.17
Family Resource Scale#◆ (FRS)	115.8	(25.5)	46	29	114.0	(20.5)	41	37	.76	-.07	115.5	(25.6)	46	26	113.6	(16.7)	41	35	.75	-.07
Family Support Scale#◆ (FSS)	29.4	(11.6)	54	29	29.3	(12.4)	54	36	.96	-.01	30.8	(10.9)	63	26	30.6	(13.1)	63	35	.94	-.02
Family Inventory of** Life Events (FILE)	8.7	(4.9)	47	29	12.2	(8.4)	29	36	.04	-.71	8.7	(5.3)	47	25	11.8	(7.4)	29	33	.07	-.58

(continued)

* Statistical analysis for BDI scores were conducted using raw scores only.

^ $$ES = \frac{\text{Expanded Intensity x - Standard Intensity x}}{\text{Standard Intensity SD}}$$

** Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

◆ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

# No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

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Table 3.10 (continued)

Pretest Data for Children and Families in the Arkansas Intensity Study

	30-Month Reassessment										42-Month Reassessment									
	Standard				Expanded						Standard				Expanded					
Variable	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	p Value	ES	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	p Value	ES
Battelle Developmental* Inventory (BDI)																				
Personal/Social	47.6	(26.4)		22	52.2	(23.8)		34	.51	.17	46.1	(26.1)		24	49.8	(23.2)		33	.58	.14
Adaptive Behavior	35.7	(22.3)		22	39.0	(17.2)		34	.55	.15	35.6	(21.1)		24	37.2	(16.5)		33	.76	.08
Motor	50.0	(37.9)		22	51.6	(28.3)		34	.86	.04	50.8	(35.9)		24	48.8	(26.8)		33	.82	-.06
Communication	24.8	(17.7)		22	25.1	(12.7)		34	.96	.02	23.1	(17.3)		24	23.9	(12.5)		33	.84	.05
Cognitive	20.5	(15.0)		22	21.6	(9.1)		34	.77	.07	20.6	(14.3)		24	20.5	(8.8)		33	.99	-.01
TOTAL	178.5	(116.0)		22	180.4	(86.7)		34	.71	.09	176.1	(111.0)		24	180.2	(83.5)		33	.88	.04
Parent Stress Index** (PSI)																				
Child Related	122.6	(27.7)	92	21	116.4	(22.8)	85	31	.40	.22	124.7	(29.3)	92	23	117.4	(23.7)	86	31	.33	.25
Other Related	124.8	(28.0)	58	21	132.5	(29.8)	71	31	.35	-.28	128.7	(32.8)	65	23	131.6	(28.5)	70	31	.73	-.09
TOTAL	247.4	(50.8)	77	21	248.9	(47.8)	79	31	.92	-.03	253.4	(57.8)	82	23	249.0	(46.6)	79	31	.77	.08
Family Adaptation and Cohesion Evaluation Scales (FACES)																				
Adaptation	22.5	(6.3)		22	21.7	(5.5)		32	.50	-.22	23.6	(7.9)		24	21.3	(5.4)		31	.23	-.29
Cohesion	38.7	(7.5)		22	39.2	(5.5)		32	.78	-.11	39.2	(7.5)		24	39.5	(5.6)		31	.88	.04
Family Resource Scale#♣ (FRS)	111.5	(26.7)	39	22	114.5	(20.2)	43	34	.66	.11	113.9	(25.9)	41	24	114.9	(20.8)	43	33	.88	.04
Family Support Scale#♣ (FSS)	30.1	(11.5)	57	22	29.8	(12.9)	57	34	.92	-.03	29.5	(12.0)	54	24	29.8	(12.6)	57	33	.93	.03
Family Inventory of** Life Events (FILE)	9.0	(5.4)	47	21	11.3	(7.6)	34	32	.21	-.43	9.1	(5.2)		24	11.5	(7.3)		31	.11	-.46

(continued)

* Statistical analysis for BDI scores were conducted using raw scores only.

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$$ES = \frac{\text{Expanded Intensity } \bar{x} - \text{Standard Intensity } \bar{x}}{\text{Standard Intensity SD}}$$

* Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

♣ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

# No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

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Table 3.10 (continued)

Pretest Data for Children and Families in the Arkansas Intensity Study

	66-Month Reassessment									
	Standard				Expanded					
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES^
Battelle Developmental[*] Inventory (BDI)										
Personal/Social	42.1	(23.9)		18	52.3	(23.4		29	.16	.43
Adaptive Behavior	31.3	(19.8)		18	39.3	(17.1)		29	.17	.40
Motor	45.6	(37.9)		18	50.0	(25.9)		29	.67	.12
Communication	22.1	(16.3)		18	25.1	(12.8)		29	.50	.18
Cognitive	18.6	(13.8)		18	21.4	(8.6)		29	.44	.20
TOTAL	159.7	(198.5)		18	188.2	(83.4)		29	.35	.26
Parent Stress Index[*] (PSI)										
Child Related	131.7	(22.0)	95	18	115.7	(22.8)	85	29	.02	.73
Other Related	132.4	(24.6)	70	18	129.2	(27.7)	65	29	.68	.13
TOTAL	264.2	(40.1)	89	18	244.9	(44.6)	76	29	.13	.48
Family Adaptation and Cohesion Evaluation Scales (FACES)										
Adaptation	23.3	(8.9)		18	21.0	(5.6)		27	.35	-.26
Cohesion	35.5	(8.4)		18	39.9	(5.5)		27	.54	.52
Family Resource Scale[#♠] (FRS)	111.4	(27.7)	38	18	114.8	(19.6)	39	28	.66	.12
Family Support Scale[#♠] (FSS)	30.4	(12.9)	57	18	31.0	(12.9)	63	29	.89	.05
Family Inventory of[*] Life Events (FILE)	9.8	(5.1)		18	11.5	(7.7)		28	.39	-.33

[*] Statistical analysis for BDI scores were conducted using raw scores only.

$$\hat{ES} = \frac{\text{Expanded Intensity } x - \text{Standard Intensity } x}{\text{Standard Intensity SD}}$$

[*] Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals. A low percentile score indicates low stress or a low number of stress-associated life events.

[♠] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

between posttest sessions. These differences were investigated in posttest analyses. It is worth noting that these differences existed even though subjects were randomly assigned to groups.

Comparability of Reassessment Contextual Measures

In addition to establishing and controlling for any pretest differences found on measures of child and family functioning, there was a possibility that contextual variables which may have changed during any of the reassessment years could have influenced the outcomes. Consequently, contextual variables were monitored throughout the project. Family demographic data (e.g., marital status, disruptive events in the family's life, family size, etc.), child health data, and access to additional therapeutic interventions were tracked using instruments developed at EIRI. The family demographic data contained in Table 3.4 indicate that pretest family structural differences remained stable between the treatment groups included at each of the reassessments. Reassessment data on a global measure of children's health and hours of therapy received from non-pre-school personnel indicate that children in both groups were perceived to be comparably healthy and that the ratio in which other services were received was similar to the planned home visit intensity ratio.

Table 3.11 summarizes analyses of the standardized measures used as family functioning contextual data collected at each of the reassessments. Across the five reassessments, three statistically significant findings appeared, all of which indicated more favorable conditions related to family functioning in the standard intervention group: at the 18-month reassessment the standard group scored statistically significantly better on the FSS, at the 42-month reassessment the same group scored statistically significantly better on the FILE, and at the 66-month Primary Negative Events score of the Social Readjustment Rating Scale. The latter

Table 3.11

Comparison of Contextual Variables in the Arkansas Intensity Study

Variable	Covariate♦	Standard Intensity $\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	Expanded Intensity $\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	ANCOVA F	P Value	ES^
8-MONTH REASSESSMENT														
Family Resource Scale#♠ (FRS)	1	113.0	(23.0)	112.8	40	28	115.5	(20.5)	115.7	48	37	.84	.36	.13
Family Support Scale#♠ (FSS)	2	29.5	(14.1)	29.5	57	28	28.0	(13.8)	28.1	50	37	.29	.60	-.10
Family Index of Life Events* and Changes (FILE)	1,3	7.8	(6.1)	8.9	47	28	11.3	(6.6)	10.3	40	34	1.36	.25	.28
18-MONTH REASSESSMENT														
Family Resource Scale#♠ (FRS)	1	114.2	(26.8)	114.8	43	25	114.8	(16.0)	114.1	41	29	.03	.86	-.03
Family Support Scale#♠ (FSS)	2	35.1	(15.7)	35.0	72	25	27.3	(11.1)	27.4	47	32	6.41	.01	-.48
Family Index of Life Events and Changes (FILE)	1,3	8.1	(7.2)	9.5	40	24	9.9	(7.7)	8.6	47	30	.41	.53	-.13
30-MONTH REASSESSMENT														
Family Resource Scale#♠ (FRS)	1	119.7	(24.3)	120.4	54	22	115.1	(17.6)	114.4	41	34	1.55	.22	-.25
Family Support Scale#♠ (FSS)	2	29.5	(14.4)	9.4	54	21	27.9	(12.2)	28.0	50	34	.20	.66	-.10
Family Index of Life Events and Changes (FILE)	1,3	7.2	94.9)	7.9	55	19	10.3	(8.10	9.7	40	32	1.08	.30	-.39
42-MONTH REASSESSMENT														
Family Resource Scale#♠ (FRS)	1	120.6	(20.6)	120.8	55	24	114.8	(23.6)	114.6	43	33	1.26	.27	-.31
Family Support Scale#♠ (FSS)	2	32.2	(15.6)	32.3	66	23	28.7	(13.9)	28.6	54	27	1.03	.32	-.11
Family Index of Life Events and Changes (FILE)	1,3	6.2	(4.5)	6.3		21	9.0	(5.4)	8.9		30	3.59	.06	-.58
66-MONTH ASSESSMENT														
Family Resource Scale#♠ (FRS)	1	120.1	(22.8)		54	18	120.0	(14.7)		54	29	.02	.98	-.00
Family Support Scale#♠ (FSS)	2	31.2	(13.7)		63	18	29.0	(12.1)		54	29	.33	.57	-.16
Social Readjustment Rating* Scale (SSRS)														
Stress		117.4	(87.9)			18	151.2	(105.2)			29	1.29	.26	.38
Primary Negative Events		14.2	(22.3)			18	43.0	(58.0)			29	4.03	.04	1.29

^ $$ES = \frac{\text{Expanded Intensity } x - \text{Standard Intensity } x}{\text{Standard Intensity SD}}$$

[*] Statistical analyses and Effect Size (ES) estimates for SRRS and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals. A low percentile score indicates low stress or a low number of stress-associated life events.

[♠] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

[♦] Covariates: 1 = FRS total (pretest), 2 = FSS (pretest), 3 = FILE (pretest)

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finding was reexamined by repeating the analysis without two outliers. This analysis resulted in there no longer being a statistically significant difference.

Overall, the contextual data suggest a sustained comparability of the two intervention groups with a few exceptions. Though some differences on the contextual variables appeared, they varied from reassessment to reassessment indicating no real pattern and suggesting that they may have been random fluctuations. Had a pattern emerged indicating a consistent contextual advantage to the standard intervention group, this may have explained the pattern of no difference on outcome measures consistently found at each of the reassessments. Therefore, contextual data did not influence the interpretation of reassessment findings, although these data will continue to be examined for emerging patterns in the future.

Measures of Child Functioning

Results of the reassessments are contained in Table 3.12. All reassessment data were analyzed using Analysis of Covariance (ANCOVA) procedures. These procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which ANCOVA is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgement of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates are indicated in the table.

Table 3.12

Reassessment Measures of Child Functioning for Alternative Intervention Groups for Arkansas

		Standard Intensity				Expanded Intensity						
* Variables	Covariates◆	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	P Value	ES^
8-Month Reassessment (CA in months)		35.6	(14.2)		29	35.5	(12.3)		38	.09	.97	.01
Battelle Developmental Inventory (BDI) **Raw Scores for:**												
Personal-Social	1	56.8	(34.8)	61.1	29	62.9	(26.3)	58.6	38	.46	.50	-.07
Adaptive Behavior	1	41.9	(25.9)	45.1	29	45.6	(18.0)	42.4	38	1.56	.22	-.10
Motor	1	57.7	(20.6)	62.6	29	66.5	(29.7)	61.5	38	.09	.76	-.03
Communication	1	27.5	(20.6)	29.8	29	33.2	(12.5)	30.9	38	.29	.59	.06
Cognitive	1	25.2	(17.6)	27.2	29	25.7	(11.4)	23.7	38	3.13	.08	-.20
TOTAL	1	209.1	(131.8)	225.8	29	233.9	(91.6)	217.2	38	.73	.40	-.07
SICD Age Discrepancies												
Receptive Communication	1	-14.6	(10.2)	-13.4	28	-12.7	(10.7)	-13.9	38	.12	.79	-.06
Expressive Communication	1	-17.0	(9.6)	-15.8	28	-15.0	(12.5)	-16.2	38	.15	.85	-.04
Vineland DQs												
Communication Domain	1	49.7	(28.1)	52.6	24	57.4	(29.2)	54.5	31	.09	.77	.07
Daily Living Domain	1	55.2	(28.3)	58.2	24	59.6	(27.8)	56.5	31	.09	.76	-.06
Socialization Domain	1	49.9	(30.3)	52.7	24	57.6	(25.9)	54.8	31	.13	.72	.07
18-Month Reassessment (CA in months)		46.7	(15.0)		26	44.9	(11.6)		35	.74	.58	-.12
Battelle Developmental Inventory (BDI) **Raw Scores for:**												
Personal-Social	1	75.2	(42.6)	78.2	26	84.5	(35.7)	81.4	35	.21	.65	.05
Adaptive Behavior	1	50.4	(28.1)	52.8	26	53.5	(21.8)	51.1	35	.43	.51	-.06
Motor	1	68.8	(45.6)	72.3	26	74.1	(33.0)	70.6	35	.12	.72	-.04
Communication	1	35.8	(23.8)	37.7	26	40.3	(19.1)	38.4	35	.06	.81	.02
Cognitive	1	29.8	(20.7)	31.4	26	31.8	(14.9)	30.2	35	.36	.55	-.06
TOTAL	1	260.1	(152.6)	272.9	26	284.2	(116.2)	271.4	35	.01	.91	-.01
SICD Age Discrepancies												
Receptive Communication	1	-19.1	(13.7)	-18.7	24	-15.7	(14.6)	-16.1	30	.47	.50	.19
Expressive Communication	1	-23.0	(13.6)	-22.7	24	-13.7	(18.8)	-14.1	30	3.62	.06	.29
Vineland DQs												
Communication Domain	1	48.9	(29.1)	50.8	24	55.8	(26.6)	54.0	31	.31	.58	.11
Daily Living Domain	1	55.0	(33.8)	56.9	24	60.4	(26.0)	58.4	31	.06	.81	-.04
Socialization Domain	1	49.7	(27.5)	51.1	24	55.6	(23.3)	54.3	31	.29	.59	.12
30-Month Reassessment (CA in months)		60.6	(15.1)		22	57.4	(13.0)		34	1.35	.43	.21
Battelle Developmental Inventory (BDI) **Raw Scores for:**												
Personal-Social	1	88.0	(51.4)	89.8	22	100.4	(40.3)	98.5	34	1.23	.27	.17
Adaptive Behavior	1	56.5	(32.7)	57.8	22	64.9	(25.1)	63.5	34	1.91	.12	.17
Motor	1	77.7	(52.1)	79.9	22	87.1	(39.6)	84.9	34	.72	.40	.10
Communication	1	44.8	(29.4)	46.0	22	47.3	(24.9)	47.1	34	.08	.78	.04
Cognitive	1	41.8	(32.0)	43.1	22	41.9	(24.7)	40.6	34	.38	.54	-.09
TOTAL	1	309.3	(191.2)	317.1	22	342.6	(145.2)	334.8	34	.64	.43	.09
SICD Age Discrepancies												
Receptive Communication	1	-27.4	(19.5)	-30.9	21	-24.0	(19.7)	-28.5	34	.28	.60	.12
Expressive Communication	1	-32.2	(15.6)	-31.9	21	-27.2	(19.3)	-27.4	34	.86	.36	.29
Vineland DQs												
Communication Domain	1	47.4	(27.4)	50.9	22	55.6	(30.3)	52.2	34	.62	.81	.06
Daily Living Domain	1	50.7	(27.0)	54.2	22	58.1	(29.0)	54.6	34	.01	.93	.01
Socialization Domain	1	47.1	(27.5)	50.5	22	55.1	(29.3)	51.8	34	.05	.82	.06
42-Month Reassessment (CA in months)		70.9	(16.2)		22	67.3	(13.2)		33	.92	.40	.22
Battelle Developmental Inventory (BDI) **Raw Scores for:**												
Personal-Social	1	103.5	(47.1)	104.1	24	109.9	(41.2)	109.2	33	.38	.54	.11
Adaptive Behavior	1	66.8	(29.6)	67.2	24	67.7	(24.9)	67.2	33	.00	.99	.00
Motor	1	91.8	(51.4)	92.6	24	92.4	(40.2)	91.6	33	.02	.89	-.02
Communication	1	51.5	(30.5)	52.0	24	55.8	(26.9)	55.3	33	.48	.49	.10
Cognitive	1	49.7	(33.8)	50.2	24	48.8	(27.5)	48.3	33	.18	.67	-.06
TOTAL	1	359.1	(188.0)	362.1	24	374.5	(149.6)	371.1	33	.14	.71	.06
Vineland DQs												
Communication Domain	1	49.7	(28.1)	50.0	24	56.6	(29.6)	56.3	33	.88	.35	.22
Daily Living Domain	1	55.2	(28.3)	55.5	24	58.3	(29.2)	58.2	33	.17	.69	.10
Socialization Domain	1	49.9	(30.3)	50.2	24	56.5	(26.5)	56.2	33	.83	.37	.20

* Statistical analysis for BDI scores were conducted using raw scores only.

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

◆ Covariate: 1 = Pretest BDI Total Raw Score

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Table 3.12 (continued)

Reassessment Measures of Child Functioning for Alternative Intervention Groups for Arkansas

		Standard Intensity				Expanded Intensity						
Variables	Covariates♦	X̄	(SD)	Adj.X̄	n	X̄	(SD)	Adj.X̄	n	ANCOVA F	P Value	ES^
66-Month Reassessment (CA in months)		95.2	(16.1)		18	94.1	(13.7)29	.25	.80	-.07		
Woodcock-Johnson Test of Achievement--Revised (WJ-R)												
Letter-Word Identification	1,2	16.3	(10.1)	17.6	14	16.5	(10.2)	15.1	23	.69	.41	-.25
Applied Problems	1,2	1.1	(.9)	1.3	14	1.2	(.9)	1.0	23	1.44	.24	.33
Dictation	1,2	11.0	(8.1)	12.2	14	11.3	(6.9)	10.0	23	.97	.33	-.27
Science	1,2	15.5	(4.1)	16.9	14	17.0	(6.1)	15.7	23	.59	.45	-.29
Social Studies	1,2	12.3	(3.5)	13.2	14	13.2	(3.7)	12.2	23	.94	.34	-.29
Humanities	1,2	13.1	(4.3)	14.3	14	15.5	(4.5)	14.3	23	.00	.98	.00
Broad Knowledge	1,2	40.9	(11.4)	44.4	14	45.7	(13.7)	42.3	23	.38	.54	-.18
Skills Knowledge	1,2	43.3	(24.89)	47.8	14	43.7	(24.6)	39.2	23	1.50	.23	-.35
Scales of Independent Behavior (SIB)												
Motor Skills	1,2	45.8	(29.8)	50.5	18	56.2	(24.1)	51.1	29	.05	.82	.03
Social Communication Skills	1,2	62.6	(31.5)	68.3	18	74.9	(26.7)	69.3	29	.05	.82	.03
Personal Living Skills	1,2	92.8	(62.0)	102.6	18	115.3	(49.5)	105.5	29	.11	.74	.04
Community Living Skills	1,2	35.3	(27.4)	39.5	18	39.8	(24.0)	35.6	29	.79	.38	-.14
TOTAL	1,2	236.6	(144.6)	260.8	18	286.2	(118.8)	261.9	29	.00	.96	.01
Social Skills (SSRS)												
Parent Evaluation of:												
Social Skills	1	35.7	(15.7)	35.8	16	42.3	(18.8)	42.3	28	1.59	.22	.41
Problem Behaviors	1,2	12.3	(9.8)	13.2	17	14.1	(6.5)	13.2	27	.00	.99	.00
Teacher Evaluation of:												
Social Skills	1	29.9	(8.7)	30.2	16	34.6	(10.5)	34.3	20	1.60	.12	.47
Problem Behaviors	1	11.3	(7.4)	11.7	16	14.3	(7.0)	13.9	21	.99	.33	.29
Inferred Self-Concept Scale (ISCS)	1	117.1	(9.1)	116.7	16	116.7	(13.5)	117.1	21	.01	.99	.04

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

♦ Covariate: 1 = Pretest BDI Total Raw Score, 2 = Child's Chronological Age at Pretest

Battelle pretest data (in each domain) were the best predictors of Battelle reassessment scores, with correlations ranging between .67 and .96 ($p < .001$). Regression analyses indicated that when BDI total raw score was used as a correlate of child functioning measures, other variables, including family data, did not account for a statistically significant additional amount of variance in outcome measures. When the pretest demographic measures that were statistically significantly different (see Table 3.4) were included, missing data caused some cases to be dropped. The changes in reassessment scores resulting from their inclusion were so small that it was decided to not use them as covariates. Although maternal education accounted for a difference found in the communication domain at the 8-month reassessment, it was not included as a covariate in BDI analyses because its inclusion had little impact on results. Thus, the pretest BDI Total raw score was used as a covariate in the ANCOVAs, with treatment groups (expanded intensity vs. standard intensity) as the independent variable and reassessment Battelle raw scores as dependent variables.

No statistically significant mean differences were found on any of the child measures at any of the reassessments except that the standard intervention group outperformed the expanded group in the cognitive domain of the BDI at 8-month reassessment and the expanded group outperformed the standard group on the expressive communication score of the SICD at the 18-month reassessment (see Table 3.13). Although some fairly strong positive effect sizes were found in two BDI subdomains and one Vineland subdomain at 30-month reassessment, these differences disappeared at the 42-month reassessment, suggesting that they may have been random variations.

Results of the initial findings of the 66-month reassessment (including only cohort 1) also appear in Table 3.12. Consistent with earlier analyses, the Pretest BDI total scores were the best predictors of all children functioning measures used at the 66-month reassessment. Additionally, the child's chronological age at pretest was a significant predictor. No statistically significant difference on the Woodcock-Johnson, the Scales of Independent Behavior, the Social Skills Rating Scale, or the Inferred Self-Concept Scale were found at the 66-month reassessment. Because the Social Skills Rating Scale and the Inferred Self-Concept Scale were designed for young elementary-age children, and because the population in this study ranged widely in their development, there was some concern that items on these scales (both of the which were inferred measures completed by teachers and parents), were not necessarily appropriate for children functioning below the age-five level. Therefore, a second analysis was conducted of the SSRS and the Inferred Self-Concept Scale excluding children whose age equivalent score on the Total SIB were below 5 years. Results from these analysis were consistent with the initial findings; hence, Table 3.12 includes all children who completed those measures, regardless of the age-equivalent scores on the SIB.

Measures of Family Functioning

Posttest analyses of family functioning measures are presented in Table 3.13. Pretest scores on outcome variables and reassessment scores on intervening variables indicated in the tables were included as covariates for posttest scores. Covariates are listed in the order in which they entered the stepwise regression equation used in the process of identifying covariates. The use of data on contextual variables is a way of accounting for differences in perceived support and critical life events that theoretically impact perceived stress.

Reassessment data indicated that some PSI differences were statistically significant (i.e., other related stress at the 30-month reassessment, and all PSI domains at the 42-month reassessment). Initial analysis of the family functioning data from the 66-month reassessment (including only cohort 1) indicated no statistically significant differences on the PSI, PSAS, or the Teacher Ratings of Parent Participation. Covariates used in these analyses included total stress scores, family cohesion scores, and total family resource scores at pretest, and critical life events (FILE) at posttest. The use of pretest stress, cohesion, and resource data was based on the relationship between these variables and posttest stress. Stress at pretest was highly positively correlated with posttest stress, while cohesion and resources were negatively correlated with stress. Cohesion and resources could have been effected by intervention. Therefore, the use of pretest data accounts for differences on these variables that existed prior to intervention. The relationships between cohesion, resources, and stress were explored in depth, and are reported below.

Subgroup Analyses

Subgroup analyses concerning mother's years of education, children's health status, children's level of functioning, and teacher ratings of parent involvement have been conducted thus far on the 8-, 18-, 30-, and 42-month reassessments. That is, children were divided into groups based on maternal completion or non-completion of high school, parental ratings of child health (as good as or worse than that of other children of the same age), mild and severe delay based on BDI DQ, and home visitor ratings of level of parental involvement. To assess the possibility of a severity of delay-by-intervention group interaction, children were grouped into severe and mild delay by a median split on pretest BDI DQ, and a group by severity level ANOVA was run. No significant interactions were found. No subgroup analyses were conducted on data from cohort one at the 66-month reassessment.

Only parent involvement has been found to produce large effects. The results of the parental education and child health data analyses suggest that the developmental progress of the children in this study was not affected by either the child's health status or by parental completion of high school. Parents were rated by their home visitor as "highly involved" if their total teacher rating score ranged from 7 to 9 and those rated as "less involved" if their total score was 6 or less. Differences found in analyses of DQ data between these groups are not statistically significant, but the effect sizes in three BDI domains (personal-social, communication, and cognition) were large at 18-month reassessment (average .45) and medium at 30- and 42-month reassessment (averages .30 and .27, respectively), favoring highly involved parents. When analyses are conducted using raw scores, however, these effect sizes average only .27, .16, and .13 (Table 3.14).

These effect sizes, though suggesting that differences may exist, provide no clear direction as to cause and effect. It may be that parent involvement and child developmental outcome are related, but if there is a cause/effect relationship, the direction of that relationship is uncertain. This uncertainty is compounded by the fact that parents who were rated as "more involved" had children with more severe delays. It may also be that teacher ratings of parent involvement were related to child developmental progress or to the teachers' relationships with the parents. The latter possibility is supported by the relationship between parent satisfaction data

Table 3.13

Reassessment Measures of Family Functioning for Alternative Intervention Groups for Arkansas Intensity Study

		Standard Intensity					Expanded Intensity							
Variable	Covariate◆	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	ANCOVA F	P Value	ES^
8-Month Reassessment														
Parent Stress Index (PSI)*#														
Child Related	1,2,3	116.7	(26.6)	117.4	86	26	116.2	(22.4)	115.5	82	31	.15	.71	.07
Other Related	1,2,3	129.0	(30.9)	131.4	68	26	134.5	(28.2)	132.2	68	31	.03	.86	-.03
TOTAL	1,2,3	245.7	(53.5)	248.7	79	26	250.7	(43.9)	247.7	78	31	.02	.89	.02
Family Adaptation and Cohesion Evaluation Scale (FACES)														
Adaptability (range 20 to 50)	4	21.8	(6.1)	21.4		29	21.4	(5.3)	21.8		36	.13	.72	.07
Cohesion (range 20 to 50)	5,2	38.9	(7.3)	38.7		29	40.0	(5.0)	40.2		35	1.76	.19	.21
18-Month Reassessment														
Parent Stress Index (PSI)*#														
Child Related	1,2,3	113.3	(28.6)	114.4	80	24	117.2	(27.2)	116.0	85	29	.07	.63	-.06
Other Related	1,2,3	124.6	(31.9)	126.2	60	24	137.1	(25.9)	135.5	73	29	3.00	.09	-.28
TOTAL	1,2,3	234.5	(53.7)	237.0	68	24	258.1	(47.1)	255.6	84	29	3.64	.06	-.35
Family Adaptation and Cohesion Evaluation Scale (FACES)														
Adaptability (range 20 to 50)	4	20.7	(6.4)	20.4		26	22.2	(6.7)	22.4		33	1.41	.24	.25
Cohesion (range 20 to 50)	5,2	38.1	(7.9)	37.8		26	38.2	(6.2)	38.6		33	.33	.57	.05
30-Month Reassessment														
Parent Stress Index (PSI)*#														
Child Related	1,2,3	111.4	(26.7)	113.0	79	20	121.1	(29.0)	119.4	87	26	1.10	.30	-.24
Other Related	1,2,3	118.2	(26.5)	121.2	50	20	139.6	(32.9)	136.6	75	26	5.90	.02	-.58
TOTAL	1,2,3	228.8	(51.2)	233.2	65	20	256.8	(58.3)	252.5	82	26	3.04	.09	-.39
Family Adaptation and Cohesion Evaluation Scale (FACES)														
Adaptability (range 20 to 50)	4	19.9	(5.2)	19.7		22	21.0	(6.0)	21.2		32	1.19	.28	.29
Cohesion (range 20 to 50)	5,2	38.5	(6.7)	38.7		22	38.4	(5.8)	38.1		32	.14	.71	-.09
42-Month Reassessment														
Parent Stress Index (PSI)*														
Child Related	1,2,3	107.9	(20.8)	106.8	71	19	119.5	(30.9)	120.6	89	22	4.49	.04	-.66
Other Related	1,2,3	117.7	(33.9)	120.7	50	19	132.8	(33.5)	129.8	66	22	1.42	.24	-.27
TOTAL	1,2,3	226.1	(59.7)	228.1	60	19	252.9	(58.1)	250.9	81	22	3.74	.06	-.38
Family Adaptation and Cohesion Evaluation Scale (FACES)														
Adaptability (range 20 to 50)	4	22.2	(8.5)	21.5		22	20.9	(5.4)	21.6		25	.00	.98	.01
Cohesion (range 20 to 50)	5,2	38.3	(9.0)	38.5		22	40.8	(5.1)	40.6		25	1.16	.29	.23

(continued)

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the coverlance adjusted score and the norming sample reported in the technical manuals. A low percentile score indicates low stress.

No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

◆ Covariates: 1 = PSI Total (pretest);2 FRS total (pretest); 3 = FILE (posttest); 4 = FACES Adaptability (pretest); 5 = FACES Cohesion (pretest)

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Table 3.13 (continued)

Reassessment Measures of Family Functioning for Alternative Intervention Groups for Arkansas Intensity Study

		Standard Intensity					Expanded Intensity							
Variable	Covariate♦	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	ANCOVA F	P Value	ES^
66-Month Reassessment														
Parent Stress Index (PSI) Short Form														
Parent Distress	1	27.5	(10.8)	26.6	60	18	26.4	(9.5)	27.4	60	29	.07	.79	.07
Parent/Child Dysfunction	1	26.2	(8.1)	25.5	85	18	22.2	(5.8)	22.9	70	29	2.00	.17	.32
Difficult Child	1	29.6	(10.5)	28.6	70	18	29.6	(9.8)	80.6	80	29	.53	.47	.19
TOTAL	1	83.3	(26.4)	80.7	80	18	78.2	(21.6)	80.8	80	29	.00	.99	.00
Parent Self-Awareness Scale	1	41.6	(8.7)	42.2		18	44.9	(11.6)	44.3		29	.44	.51	.24
Teacher Rating of Parent Participation														
Knowledge/Understanding	6,7	8.2	(2.7)	8.6		17	8.6	(2.4)	8.3		23	.17	.69	-.11
Skills/Support	6,7,8	13.3	(4.7)	13.9		17	16.2	(3.6)	15.6		23	1.93	.17	.35

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals. A low percentile score indicates low stress.

# No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the longitudinal studies (currently, 645 families with handicapped children).

♦ Covariates: 1 = PSI Total (pretest);2 FRS total (pretest); 3 = FILE (posttest); 4 = FACES Adaptability (pretest); 5 = FACES Cohesion (pretest)

Table 3.14

Subgroup Analyses on Reassessment Measures of Child Functioning for Parent Involvement Groups

		Less Involved				More Involved						
Variables	Covariates♦	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	P Value	ES^
8-Month Reassessment CA (months)		35.5	(13.0)		38	35.6	(13.4)		29	1.07	.84	.01
Battelle Developmental Inventory* (BDI)												
Personal-Social	1,2	65.1	(26.1)	60.0	38	54.0	(33.7)	59.1	29	.05	.82	-.04
Adaptive Behavior	1,2	49.0	(18.8)	45.2	38	37.4	(23.7)	41.3	29	3.05	.09	-.21
Motor	1,2	72.2	(29.7)	65.7	38	50.2	(35.6)	56.6	29	7.19	.01	-.31
Communication	1,2	33.1	(14.6)	29.9	38	27.7	(18.9)	30.8	29	.15	.70	.06
Cognitive	1,2	27.8	(11.9)	25.4	38	22.5	(16.6)	24.9	29	.04	.84	.04
TOTAL	1,2	247.1	(95.1)	226.2	38	191.9	(122.7)	212.8	29	1.76	.19	-.14
Pretest BDI Raw Score	2	199.0	(83.4)	197.5	38	161.9	(109.6)	163.4	29	4.61	.04	-.42
18-Month Reassessment CA (months)		45.6	(13.5)		36	45.8	(12.7)		25	1.13	.77	.01
Battelle Developmental Inventory* (BDI)												
Personal-Social	1,2	84.0	(33.2)	75.1	36	75.6	(45.2)	84.4	25	3.58	.06	.28
Adaptive Behavior	1,2	56.8	(22.2)	51.5	36	45.6	(26.6)	50.9	25	.05	.83	-.03
Motor	1,2	82.9	(34.6)	74.8	36	56.0	(38.5)	64.1	25	5.56	.02	-.31
Communication	1,2	39.7	(19.0)	34.7	36	36.6	(24.3)	41.5	25	5.79	.02	.36
Cognitive	1,2	32.9	(16.3)	29.0	36	28.2	(19.0)	32.1	25	2.07	.16	.19
TOTAL	1,2	296.2	(117.5)	265.1	36	242.0	(147.6)	273.0	25	.41	.53	.07
Pretest BDI Raw Score	2	58.1	(19.7)		36	39.4	(28.2)		25	9.31	.00	-.95
30-Month Reassessment CA (months)		58.3	(13.9)		33	59.2	(13.9)		25	1.01	.99	.08
Battelle Developmental Inventory* (BDI)												
Personal-Social	1,2	102.0	(39.0)	90.6	33	86.2	(51.8)	97.6	23	.97	.23	.18
Adaptive Behavior	1,2	69.2	(23.7)	62.3	33	50.7	(31.3)	57.6	23	1.66	.20	-.20
Motor	1,2	93.4	(37.2)	82.6	33	69.0	(51.3)	79.8	23	.24	.62	-.08
Communication	1,2	50.2	(23.4)	43.6	33	42.3	(30.4)	48.9	23	1.76	.19	.23
Cognitive	1,2	46.0	(26.1)	39.9	33	36.0	(29.1)	42.1	23	.30	.59	.08
TOTAL	1,2	361.1	(140.3)	319.3	33	284.1	(186.8)	325.9	23	.11	.74	.05
Pretest BDI Raw Score	2	203.0	(83.3)	202.8	33	159.6	(113.7)	159.8	23	5.80	.02	-.52
42-Month Reassessment CA (months)		69.1	(13.8)		33	69.2	(15.2)		22	1.21	.61	.01
Battelle Developmental Inventory* (BDI)												
Personal-Social	1,2	112.4	(37.0)	103.4	33	99.4	(51.6)	108.5	22	.50	.48	.14
Adaptive Behavior	1,2	73.3	(22.7)	68.1	33	58.5	(30.0)	63.7	22	1.10	.30	-.19
Motor	1,2	101.4	(38.0)	93.0	33	78.5	(51.2)	86.8	22	.84	.36	-.16
Communication	1,2	56.1	(25.7)	50.5	33	50.7	(32.1)	56.4	22	1.81	.18	.23
Cognitive	1,2	53.2	(28.1)	48.1	33	43.3	(32.3)	48.4	22	.01	.94	.01
TOTAL	1,2	393.5	(146.1)	359.7	33	330.3	(187.0)	364.1	22	.04	.87	.03
Pretest BDI Raw Score	2	191.3	(79.5)	194.1	33	159.7	(113.7)	156.8	22	4.41	.04	-.43

* Statistical analysis for BDI scores were conducted using raw scores.

^ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

♦ Covariates: 1 = Pretest BDI Total Raw Score; 2 = Chronological Age at Pretest

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and teacher ratings of parent involvement data. Unfortunately, we found no unbiased and reliable wav of assessing parent involvement. Thus, it is not possible to draw conclusions from this finding.

Regarding parent stress, a relationship between family cohesion, resources, and stress was suggested above. The data suggest that families that report higher levels of cohesion and resources also reported less stress. Dividing families into groups of high and low cohesion and high and low resources indicated that level of resources was a better predictor of stress than cohesion. Median splits were determined for total FRS score at each posttest to assign groups at that posttest. Covariates included pretest PSI total scores, posttest FACES cohesion scores, and posttest FILE scores. Data in Table 3.15 indicate that statistically significant differences in stress were reported at Reassessments 2 and 4, and at least one effect size larger than .20 was found at all posttest sessions. This suggests that a family's perception of available resources may serve to reduce perceived stress. It may also be, however, that some families are "resource users" who take advantage of resources available to them, while others are "self-reliant" in that they do not make use of resources outside the family (Gallagher, 1990). In the latter case, resource users would be less stressed from the beginning. Table 3.15 indicated that high resource families were less stressed at pretest, providing support for the "resource user" concept. Covarying for family cohesion (FACES) and stressors (FILE) accounted for group differences in those areas at each test session. Covarying for pretest stress at all posttest sessions may have been too conservative a procedure in addressing this issue, yet differences were identified (Cohen [1988] defined an effect size of .25 as a "medium" effect size). This gives evidence that families that use available resources are less stressed than those who do not use or who do not have resources available. It does not answer the question raised by Gallagher concerning family type with respect to the use of available resources. Unfortunately, our data do not address that specific question.

Table 3.15

Reassessment Family Stress Data for Alternative Rescurce Levels for Arkansas Intensity Study

Variable	Covariate[♦]	Low Resources					High Resources					ANCOVA F	p Value	ES[^]
		x̄	(SD)	Adj.x̄	%ile	n	x̄	(SD)	Adj.x̄	%ile	n			
PRETEST														
Parent Stress Index (PSI)[*]														
Child Related	1,2	116.7	(26.6)	117.4	86	26	116.2	(22.4)	115.5	82	31	.15	.71	.07
Other Related	1,2	129.0	(30.9)	131.4	68	26	134.5	(28.2)	132.2	68	31	.03	.86	-.03
TOTAL	1,2	245.7	(53.5)	248.7	79	26	250.7	(43.9)	247.7	78	31	.02	.89	.02
8-MONTH REASSESSMENT														
Parent Stress Index (PSI)[*]														
Child Related	3,4,5	116.7	(26.6)	117.4	86	26	116.2	(22.4)	115.5	82	31	.15	.71	.07
Other Related	3,4,5	129.0	(30.9)	131.4	68	26	134.5	(28.2)	132.2	68	31	.03	.86	-.03
TOTAL	3,4,5	245.7	(53.5)	248.7	79	26	250.7	(43.9)	247.7	78	31	.02	.89	.02
18-MONTH REASSESSMENT														
Parent Stress Index (PSI)[*]														
Child Related	3,4,5	113.3	(28.6)	114.4	80	24	117.2	(27.2)	116.0	85	29	.07	.63	-.06
Other Related	3,4,5	124.6	(31.9)	126.2	60	24	137.1	(25.9)	135.5	73	29	3.00	.09	-.28
TOTAL	3,4,5	234.5	(53.7)	237.0	68	24	258.1	(47.1)	255.6	84	29	3.64	.06	-.35
30-MONTH REASSESSMENT														
Parent Stress Index (PSI)[*]														
Child Related	3,4,5	116.7	[illegible]	117.4	86	26	116.2	(22.4)	115.5	82	31	.15	.71	.07
Other Related	3,4,5	129.0	[illegible]	131.4	68	26	134.5	(28.2)	132.2	68	31	.03	.86	-.03
TOTAL	3,4,5	245.7	[illegible]	248.7	79	26	250.7	(43.9)	247.7	78	31	.02	.89	.02
42-MONTH REASSESSMENT														
Parent Stress Index (PSI)[*]														
Child Related	3,4,5	113.3	(28.6)	114.4	80	24	117.2	(27.2)	116.0	85	29	.07	.63	-.06
Other Related	3,4,5	124.6	(31.9)	126.2	60	24	137.1	(25.9)	135.5	73	29	3.00	.09	-.28
TOTAL	3,4,5	234.5	(53.7)	237.0	68	24	258.1	(47.1)	255.6	84	29	3.64	.06	-.35

[^] Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[*] Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores (adjusted) and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

[♦] Covariates: 1 = FACE Cohesion (pretest); 2 FILE (pretest); 3 = PSI Total (pretest); 4 = FACE Cohesion (posttest); 5 = FILE (posttest)

Conclusions

The results of this study do not support the hypothesis that increasing the frequency of home-based early intervention visits from once to twice per week will result in better outcomes for participating children or families. Even though there are a few statistically significant results, the overall pattern is one of no effect. The absence of any effect is particularly important because all of the outcome measures used in this study were logically related to the type of intervention delivered.

As noted at the beginning of this report, a number of previous reviews of the early intervention research literature have concluded that more frequent delivery of

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services results in better outcomes for participating children. Therefore, it is important to consider why the findings of this study are contrary to that conventional wisdom.

Although no research study is perfect, this study was well-designed and seems to address all of the threats to internal validity cited by Campbell and Stanley (1963) and others. For example, children were randomly assigned to groups, and the comparability of participants on key measures that were highly related to the outcomes was documented. Analysis of covariance was used to adjust for any residual pretreatment differences and to increase the power of the design. The design/analysis combination resulted in excellent statistical power to detect moderate size differences and good power to detect small differences. Outcomes were assessed by people who were uninformed about the hypotheses of the study, and included both child and family measures that were theoretically relevant to the types of interventions delivered. Although some attrition was present, analyses showed that this had little, if any, effect on the comparison of groups. Historical threats to the internal validity of the study were examined and discounted (by verifying that contextual variables such as the receipt of additional services, disruptive family events, or serious health problems might have contaminated the results of the study). Therefore, it is reasonable to conclude that any discrepancy between conventional wisdom and this study's findings were not, at least in any simplistic way, the result of methodological weaknesses.

In fact, this study's findings are the not only ones which have contradicted conventional wisdom. Of the six well-designed studies with children who were disabled that have directly examined the issue of frequency or intensity of intervention, only one (Lovaas, 1987) showed statistically significant differences in favor of the more intense or more frequent group. The other five (Barnett & Pezzino, 1987; Sandow et al., 1981; Jenkins et al., 1982; Law, 1991; and Taylor et al., 1984) concluded that there was no advantage to more frequent or more intensive interventions. All of these researchers seemed surprised by a finding of no difference and concluded with calls for further research on this topic. We agree. Further research is important. But, it is also important to emphasize that the results of this study are not totally inconsistent with the results of previous research which has directly examined the intensity hypothesis.

The results of a single study, or of a group of studies conducted from within a single methodological paradigm, should never be the sole basis for drawing conclusions about a phenomenon as complex as the frequency with which early intervention services should be delivered. Rather, these questions must be examined from a variety of methodological and theoretical perspectives in order to construct a set of viable conclusions. While the present study improved upon the methodological weaknesses of many of the earlier studies, that is not to say that methodological improvements are no longer needed. While this study attempted to examine all relevant variables on which the two types of intervention were intended to have an impact, it is possible that there were areas of differential impact which we presently do not know how to reliably measure, and which, if they were reliably measured would demonstrate that one intensity was more cost-effective than the other. It is also possible that while the constructs which were the focus of this study were appropriate, they may not have been as sensitively examined as would be necessary to detect the differential effects of the two intensities of the intervention. Consequently, additional effort is necessary in identifying and measuring other possible outcomes and ways of more sensitively measuring those constructs which were the focus of this study.

The results of the Lovaas (1987) study suggest another possibility which must be considered when interpreting the findings of this study. Lovaas reported a substantial difference between autistic children who received 40 hours per week of 1:1 services compared to another group of autistic children who received only 10 hours per week of intervention (average ES = 1.41). Although the Lovaas study was not as rigorously designed as the one reported here (children were not randomly assigned to groups, analysis of covariance was not used, diagnosticians were not "blind," treatment verification techniques were not reported), it was a reasonably well-designed study. It is possible that the dramatically different results between Lovaas' findings and those reported from this study may have been the result of the substantially larger differences in intensity that were present in that study (40 vs. 10 hours per week) compared to this study (2 vs. 1 hour per week).

Many people seem to expect that early intervention with children having disabilities will accomplish dramatic results with relatively modest expenditures. In reality, it may well be that the relationship between input and outputs is more consistent with what is depicted in Figure 1. If such a relationship exists, it is not surprising that this study (as well as the others cited above) found no differences between groups. All of these studies (i.e., the present study, Barnett & Pezzino, 1987; Jenkins et al., 1982; Law et al., 1991; Sandow et al., 1981; Taylor et al., 1984) made comparisons that fell within the shaded area of Figure 1. The lack of effect for those comparisons could be explained by the fact that the slope of the relationship is horizontal in that entire range. For there to be substantial benefits associated with increasing the frequency or the intensity of intervention, we may have to make comparisons in which the more intensive intervention is to the right of the shaded area. Because most previous studies with children who have disabilities have not made those comparisons, it may appear as if more intense interventions are not beneficial, when in fact it is merely a function of not having broken through the "threshold" which is necessary to achieve results.

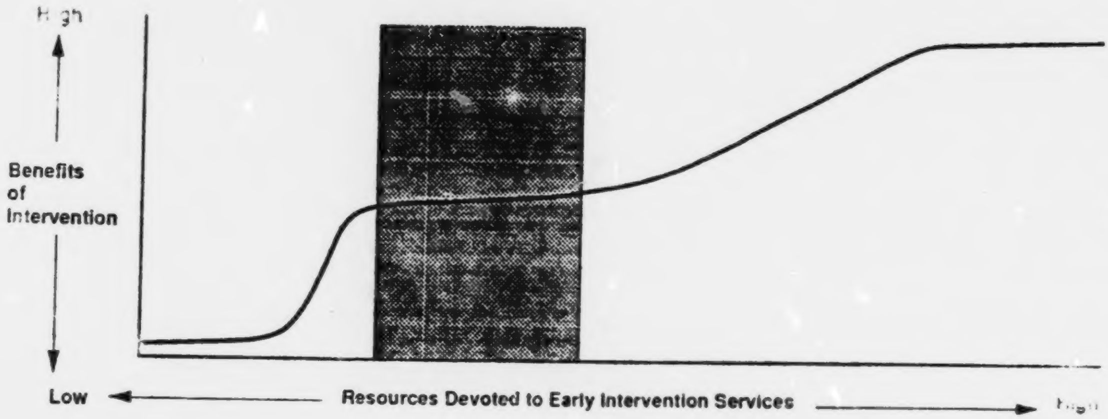


Figure 1. Hypothetical relationship between resources devoted to early intervention and benefits for participants.

Summary

The results of this study add to a growing body of research literature which suggests that increasing the frequency or intensity of intervention for children with disabilities, within the range of current practice, will not have a demonstrable effect. Those findings are important for parents, service providers, and researchers. For parents, it is important to be clear that the results of this study do not suggest that early intervention is unimportant or does not result in benefits. The purpose of this study was to examine the effects of increasing the frequency of intervention, not an evaluation of whether early intervention was beneficial. Although a no-treatment control group was not included in this study, previous work such as that by Sandow et al. (1981) does provide support for the concept that some intervention is better than no intervention. Furthermore, children in both groups made substantial progress from pretest to each of the subsequent reassessments.

Under Public Law 99-457, all children with disabilities are guaranteed the right to an appropriate early intervention program. Thus, the question is not whether or not early intervention ought to be provided, but instead what type of intervention is best for which children. These data suggest that increasing the frequency of this type of home-based early intervention program from 1 to 2 visits per week does not result in benefits for participating children and parents. Whether such benefits would have been achieved by designing a different type of intervention program, or by further increasing the frequency or intensity of the intervention, is a question which will require more research. As noted by Public Law 99-457, parents are essential partners in the early intervention enterprise, and hopefully their insights and experiences can be considered and incorporated as researchers design and evaluate those types of intervention programs.

For people providing services to these types of children, the results suggest that if the choice is between increasing the frequency of home-based intervention from 1 to 2 times per week and increasing the number of children to be served by a 1 time per week home-based early intervention program, the latter choice may make the most sense. As demonstrated by the cost analysis reported herein, substantial resources are required for increasing the frequency of home visits from one to two times per week. For a program similar to that described here, those resources are probably best used to serve additional children.

Of course, there may be alternative ways to provide early intervention which is more efficient than the intervention used in this study. That possibility needs to be examined, but the results of this study demonstrate that "common sense expectations" may not be fulfilled. Therefore, in designing and testing alternative types of interventions, it is critical that they be subjected to rigorous evaluations to determine whether they really are better than current practice.

For researchers, the results of this study suggest the need for further examination of this topic. In addition to studies which replicate the findings of this study in examining comparisons such as once vs. twice or once vs. three times per week, it is also important to systematically test the threshold hypothesis to determine whether much more intensive interventions would result in demonstrable benefits. In doing that, however, it is critical that research be rigorously designed so that threats to the internal validity of those studies can be controlled.

For the time being, however, the results of this study suggest caution in devoting substantial resources to increasing the frequency of home-based early intervention programs for children with disabilities from one visit per week to two to three visits per week. Instead of such expansion, resources should be used to serve more children, provide different types of services, or evaluate different types of early intervention services which may be more beneficial than those currently being offered.

JORDAN SCHOOL DISTRICT

Project #4

COMPARISON: Children with Mild to Severe Disabilities--Participation in a 3-day-per-week, center-based preschool program versus participation in an enhanced 5-day-per-week, center-based preschool program.

SITE COORDINATOR: Chris Giacovelli, Early Intervention Program Coordinator, Jordan School District

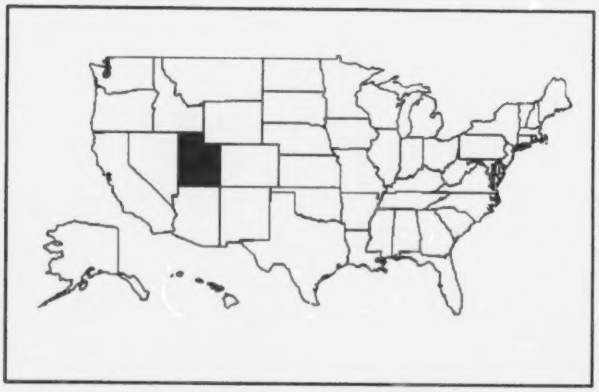
EIRI COORDINATORS: Linda Goetze and Mark Innocenti

LOCATION: Midvale, Utah

DATE OF REPORT: 10-1-1992

Rationale for the Study

Limited evidence exists in the early intervention literature to guide program decisions concerning the relative effectiveness of various intensities of program efforts (Casto & Mastropieri, 1986; Innocenti & White, 1991; White & Casto, 1985). The frequency and intensity of services in early intervention programs varies widely, based on factors such as philosophical orientation and professional judgment of child needs.



With the passage of the federal mandate to provide services to all preschool-aged children with disabilities (P.L. 99-457), the intensities of programs may change to reflect the effect of more children in programs and related funding and personnel issues. One result may be that programs will decrease their intensity in an attempt to serve more children with the same level of funding. Conversely, the incentives created from this legislation may increase the number of individuals who advocate in favor of increased intervention services for young children with disabilities. This could generate increased financial support which might result in more intensive programs being offered to such children.

Decisions that can potentially affect the lives of children and their families, such as the intensity of a program, must be made using a data base of the benefits and costs of programs of varying intensity. This study will help provide information for this data base by comparing two common intensity levels of intervention services for preschool-aged children with disabilities.

Review of Related Research

The field of early intervention commonly holds the belief that more is better (Casto & Mastropieri, 1986). Although this belief is common to our culture in many areas, it may not be valid in all cases (e.g., the megavitamin controversy; Perils of, 1987; Vitamins, 1986). Unfortunately, even though treatment intensity may be an important variable for early intervention programs, little systematic research has investigated whether more intensive programs are better for children or families (Bailey & Bricker, 1984; Casto & Mastropieri, 1986; White & Casto, 1985).

Table 4.1 summarizes characteristics of four previous studies that directly compared center-based early intervention programs of different intensities for children with disabilities (Barnett & Pezzino, 1987; Jago, Jago, & Hart, 1984; Lovass, 1987; Taylor, White, & Pezzino, 1984) and two studies which made similar comparisons for children from low socioeconomic backgrounds (Blank & Solomon, 1968; Washington & Osborne, 1969). A more thorough discussion of these studies is given in Innocenti and White (1991), but a brief summary is given here.

Table 4.1

Studies Which Examined Intensity of Early Intervention in a Center-Based Setting

Reference	More Intensive Group	Less Intensive Group	Study Quality	Duration of Program	Child-Risk Factor	[♦]Effect Size
Barnett & Pezzino (1987)	Full-day, five-day-per-week, center-based preschool program; school district operated.	Half-day, five-day-per-week center-based preschool program; school district operated.	High	Academic year (9 months)	Disabled	-.11
Blank & Solomon (1968)[*]	Five days of individual tutoring in addition to 5-day-per-week nursery school placement.	Three days of individual tutoring in addition to 5-day-per-week nursery school placement.	Medium	45 days (9 weeks)	Disadvantaged	.57
Lovass (1987)[*]	Forty hours of one:one behaviorally oriented treatment per week (treatment carried out in home, school, and community).	Ten hours of one:one behaviorally oriented treatment per week (treatment carried out in home, school, and community).	Medium	2 years, up to 6 years (child dependent)	Disabled	1.41
Jago, Jago, & Hart (1984)[*]	Two mornings per week of center-based activities focused on language development and total communication. Parents were involved one morning per week.	One morning per week of center-based activities focused on social and self-help skills.	Low	7 months	Disabled	.15
Taylor, White, & Pezzino (1984)	Full-day, five-day-per-week center-based preschool program, school district operated.	Half-day, five-day-per-week center-based preschool program, school district operated.	High	9 months	Disabled	.10
Washington & Osborne (1969)[*]	Half-day school district kindergarten five-days-per-week, plus half-day center program focused on academic skills 5-days-per-week.	Half-day school district kindergarten five-days-per-week.	Medium	9 months	Disadvantaged	.80

[*] Studies also included nonintervention or combined intervention groups. These other groups are not included here.

[♦] Effect size is the average effect size across all dependent measures reported in the study.

The most intensive study, Lovass (1987), shows the greatest efficacy with an ES of 1.41, quite clearly supporting the hypothesis that more intensive programs have positive results. Two of the remaining five studies show strong, positive effect sizes, while the other three are small or negative. The two studies which were rated highest on methodological quality have opposite signs and relatively low effect size. The authors of both of these studies, however, pointed out potential confounds in the intensity comparisons (i.e., "longer is not necessarily more"). The comparison in the Taylor study was a full vs. half-day intensity difference, but it was noted that the second half of the full-day intervention included activities like nap and lunch time. The Barnett and Pezzino intervention comparison was organized in a similar way. Consequently, there may not have been twice as much time spent in instructional activities in the full-day program as in the half-day programs.

Methodological quality ratings were based on evaluation of threats to internal validity as defined by Campbell and Starling (1963). The two studies with disadvantaged children were rated of medium methodological quality and show moderately large effect sizes, although it is unclear whether the results of studies done with disadvantaged children should be generalized to children with disabilities since there are so many differences between the two groups. The Jago, Jago, and Hart study was of low methodological quality. The Lovass study shows incredibly positive results for one subgroup of children with disabilities. However, it has not yet been replicated and the intensity of the high-intensity group is so high that it may be unrealistic to expect that it could ever be done for all children with disabilities at public expense, and it is not clear that the results are even conceptually applicable to non-autistic children with disabilities, which constitutes over 99% of all children with disabilities.

In drawing conclusions about whether more intensive early intervention programs will be better for children with disabilities, we are left with two well-done studies which show very small effects and one fairly well-done study which may not be relevant to questions about how most early intervention programs for children with disabilities should be structured. Furthermore, the results of these three studies are not consistent, and there are a number of other parameters of intensity which need to be investigated. In spite of the rather consistent claim in the literature that more intensive programs are more effective, it is clear that not much evidence exists. Given the importance of the question in terms of the resources available for early intervention as well as the potential benefits for children, this seems to be an area which is urgently in need of more research.

If more intensive interventions are really more effective, one would expect that those studies which made experimental vs. control group comparisons where the experimental group provided relatively higher levels of service would find more substantial differences than those experimental versus control group comparisons where the differences between experimental and control groups were not as great. Although such evidence is indirect, it is the type of evidence cited in some reviews of the literature which have concluded that more intense early intervention programs are more effective (see for example, Bryant and Ramey, 1987; and Dunst, Snyder, and Mankinen, 1989).

A much more comprehensive data base to examine this hypothesis than previously used is available in a meta analysis corducted by EIRI of approximately 200 experimental versus control studies of early intervention (see Casto, White, & Taylor, 1983, for a complete discussion of this analysis). By investigating the average ES for experimental vs. control group comparisons where the total hours of intervention, the hours of intervention per week, and the duration of intervention in weeks for the experimental group were different, one can at least see whether the results are consistent with the hypothesis that more intensive intervention programs will be better. As shown in Table 4.2, differences between experimental and control groups are no greater for those studies where the experimental group was "more intense" or of "longer duration" than in those studies where the experimental group

Table 4.2

Average Effect Size for Different Intensity Factors From Studies Examining Early Intervention on Children with Disabilities

	Quality of Studies*			
	Good	Fair	Poor	Total
Total Hours of Intervention				
< 50	.78 (4 [2])+	1.01 (12 [3])	.89 (18 [6])	.92 (34 [10])
50 - 249	----^	.08 (3 [1])	1.20 (19 [5])	1.05 (22 [6])
250 - 499	----	.54 (5 [2])	.65 (13 [8])	.62 (18 [8])
500 - 749	.66 (2 [1])	3.31 (1 [1])	.41 (21 [4])	.54 (24 [6])
750 - 999	----	----	1.16 (5 [3])	1.16 (5 [3])
1000 - 1999	.52 (2 [1])	.66 (8 [2])	.59 (7 [3])	.62 (17 [5])
≥ 2000	----	.69 (2 [1])	1.32 (6 [2])	1.16 (8 [2])
Hours of Intervention Per Week				
< 2	.78 (4 [2])	1.34 (1 [1])	1.17 (11 [4])	1.08 (16 [7])
2 - 4.9	----	.89 (16 [2])	1.03 (31 [7])	.98 (47 [7])
5 - 9.9	----	----	.53 (15 [5])	.53 (15 [5])
10 - 12.9	----	1.19 (4 [2])	.71 (11 [9])	.83 (15 [10])
13 - 19.9	.84 (6 [2])	.30 (5 [2])	.44 (22 [4])	.49 (33 [8])
20 - 39.9	.52 (2 [2])	.70 (4 [1])	.86 (5 [3])	.74 (11 [5])
≥ 40	----	----	----	----
Duration of Intervention (Weeks)				
≤ 12	.39 (8 [3])	1.44 (7 [3])	.83 (25 [10])	.85 (40 [15])
13 - 25	.13 (2 [1])	.55 (28 [4])	.83 (41 [15])	.70 (71 [19])
26 - 38	----	.57 (23 [8])	.71 (81 [27])	.68 (104 [33])
39 - 51	.65 (11 [2])	.70 (8 [2])	.96 (40 [23])	.87 (59 [26])
52 - 77	----	.64 (8 [3])	1.00 (24 [11])	.91 (32 [14])
78 - 103	----	.69 (2 [1])	.90 (13 [6])	.87 (15 [6])
≥ 104	.10 (6 [1])	.01 (7 [1])	.49 (11 [4])	.26 (24 [5])

NOTES: *Based on threats to internal validity

+(# of Effect Sizes [# of studies])

^No data for cell

was less intense or of shorter duration. Admittedly, these data may be confounded by a number of other factors (the severity of subjects participating in the studies, the types of dependent measures used, the training of the people delivering the intervention, etc.). For this analysis to be valid, it assumes that all of those other variables are evenly balanced across the various categories of intensity, and this may not be the case. At any rate, there is little support here for the hypothesis that more intensive interventions are more effective and this emphasizes the need to conduct well-controlled, methodologically sound, studies to address the intensity question.

Intensity of intervention may vary according to total hours of intervention, staff:child ratio, duration of intervention in weeks, or hours per week of intervention. While no single study can address all intensity variations, this study directly examined one aspect of the question of program intensity. This study, which presents the results of a cost-effectiveness study of a 3-day versus a 5-day-per-week early intervention preschool program, may be of particular importance, since both levels of intensity represent typical intervention programs, and study results could affect personnel and funding issues. Because the effects of intervention on parent and family functioning have not received sufficient investigation in previous early intervention research (Casto & Mastropieri, 1986; Dunst, 1986), the impact of these different program intensities on parents and families, as well as their child, was examined.

Overview of Study

Intensity has many dimensions (e.g., programs may vary on hours per day of intervention, days per week of intervention, degree of engaged learning time in which children are involved, etc.). This study contrasted preschool intervention services for children participating in two different levels of intervention as defined along a number of different intensity dimensions. The children who participated represented a wide array of disabilities such as cerebral palsy, Down syndrome, and communication disorders. First, children in one group received 5-days-per-week, 2-hours-per-day preschool intervention services in classrooms established to provide appropriate, child-centered services for children with disabilities (more intensive group). Children in the other group received 3-days-per-week, 2-hours-per-day preschool intervention services in the same classroom format (less intensive group). The more intensive condition in this study also had a 3:1 child/teacher ratio, while a 5:1 child/teacher ratio existed for the less intensive condition classrooms. A third dimension along which intensity was different was that more intensive condition classrooms were provided with increased availability of communication and motor therapists. In practice, this increased therapy time resulted in the presence of a speech and language therapist in more intensive condition classrooms each day they were in session, while the speech and language therapists were available on an every-other-day basis for the less intensive classroom condition. Differences in program efficacy were evaluated by assessing child and family outcomes.

Method

This study was conducted in conjunction with the early intervention program of the Jordan School District, a suburb of Salt Lake City, Utah. The Jordan School District has a history of active involvement in early intervention. Although prior to the 1987-88 academic year, early intervention services had been funded by the Utah Division of Social Services, the intervention services were housed in a school in the Jordan District. With the passage of P.L. 99-457 and State of Utah mandates, the district assumed the financial and administrative responsibility for early intervention for all preschoolers with disabilities living in the area. This resulted in the district expanding early intervention classrooms into neighborhood schools while retaining experienced staff. At the time of this study, the Jordan

District maintained early intervention rooms at three schools. The district offered a variety of intervention options ranging from home intervention, to various classroom mainstream options, to placement in neighborhood daycare centers.

The early intervention program previously provided 5-days-per-week, 2½ hours-per-day, classroom-based intervention services to a limited number of qualified children. Children who met both age and Utah State Office of Education developmental criteria, as explained in the Recruitment section below, were placed on a waiting list, and classroom slots were filled on a first-come basis. When responsibility for preschool services was transferred to the school district, the district began serving all eligible preschoolers and providing transportation. These factors resulted in a change in a reduced service structure of the preschool program to a 3-days-per-week, 2-hours-per-day program.

This change in program intensity raised concerns from preschool providers, school administrators, and parents of children with disabilities. In conjunction with the Early Intervention Research Institute (EIRI), the Jordan School District received additional funds from the Utah State Office of Education to determine whether a more intensive (and consequently, more expensive) early intervention program would result in measurable benefits for children and families. The specific comparison investigated was established through negotiations with all participating agencies. Based on the amount of additional money available from the State Office of Education, the school district was directed to design a more intensive intervention program which they believed would have the greatest likelihood of benefitting children and families. They were free to vary whatever parameters (e.g., length of day, number of days per week, student:teacher ratios, availability of therapists, etc.) that they thought would have the greatest impact. This specific comparison design is described more completely in a subsequent section.

Subjects

Subjects for this study came from four classrooms located at two schools (two classrooms per school). All subjects were recruited for this study at the beginning of the 1988-89 school year. Fifty-three children (28 less intensive, 25 more intensive) between 36 and 62 months of age ($\bar{x}$ = 50 months) participated in the study. Sixteen children in the less intensive group were male, and eight males were in the more intensive group. The age equivalent for the children, based on the total score of the Battelle Developmental Inventory (BDI), ranged from 16 to 46 months ($\bar{x}$ = 30 months). The majority of children were mild to moderately disabled (65% of children had DQs of 65 or below; no child had a DQ lower than 40).

Recruitment. The Utah State Office of Education criteria for acceptance into the early intervention program specified that preschool-aged children were eligible for services if they demonstrated a delay from the norm of -1.5 or greater standard deviations in three developmental areas, of -2.0 or greater standard deviations in two developmental areas, or -2.5 or greater standard deviation in one developmental area. Multiple assessments and evaluators were used by the school district in determining eligibility.

All parents of children identified as disabled at the schools where the classrooms were located were considered for participation in this study. Parents were informed by phone, in person, or sent a letter regarding the study. Parents were then given an informed consent form to read. They were asked to agree to participate. The site contact person was available to answer parent questions and concerns. Approximately 5% of parents refused participation. The majority of these refusals were from parents of younger children who desired the less intensive program.

Assignment to groups. During the one-year intervention study period, subjects attended one of two schools, dependent on address. In each school, there were two classrooms, one of which was established as a more intensive classroom. There were two teachers, one at each school. Each teacher conducted both a less and more intensive classroom. The time of day services were delivered (morning or afternoon) was counterbalanced across schools so that there was an a.m. and p.m. five-day classroom. Similarly, there was an a.m. and p.m. less-intensive classroom.

After a child was identified and the parents indicated a willingness to participate, the site contact sent information about the child (including a rating of degree of disability [mild, moderate, severe] based on the initial district assessment) to the EIRI research coordinator. This information was used to place each child in a school by severity matrix (2 x 3). For subjects in each cell, there were four possible sequences of assignment (ABAB, BABA, ABBA, and BAAB; where A = the more intense group and B = the less intense group). A die was cast to determine the assignment sequence for each set of 4 children in each cell. This process was repeated for each cell of the matrix as the first child in a cell was identified.

Attrition. Fifty-three subjects were recruited to participate in this study at the beginning of the 1988-89 school year. To date, none of the subjects have been lost. Reassessment data for four follow-up years were obtained for all 53 subjects and their parents.

Demographic characteristics. The subject pool for this study is now complete. Funds provided by the Utah State Office of Education were for a single year. The demographic characteristics of the population sample in this study approaches what many consider the "typical" American family (see Table 4.3). The average parents in the study had slightly more than a high school education and were in their early 30s. In 92% of the families, the parents of the child were married and living together, and the mother was the primary provider of child care (96%); families had an average of four children, including the child with disabilities. Fathers worked a 40-hour week in either blue collar or technical/managerial positions; mothers did not work or held part-time jobs. The average family income was $30,000. All the families spoke English as their primary language, and the majority (94%) were Caucasian.

Demographic differences between the subjects in the less and more intensive groups can be evaluated using the p-values and effect sizes given in Table 4.3. Statistically significant differences ($p < .10$) existed for percent male subjects, years of education for the mother, hours per week mother was employed, and number of siblings. The more intensive subjects had more educated mothers who worked more each week than the less intensive subjects. The more intensive group also had a higher percent of children in daycare than the less intensive group. The number of siblings in families receiving the less intensive treatment was higher than in the more intensive intervention families.

Logically, these differences between the demographic characteristics of the more and less intensive subjects and their families are interconnected. More educated mothers could be expected to work more as their earnings in jobs outside the home would, on average, be higher. Families with two parents who work also could be expected to have a higher mean income than families where only the father is employed. Families where the mother is employed outside the home more hours use daycare more than families where the mother works only in the home or fewer hours outside the home. Finally, the number of siblings is higher for the less intensive group who use daycare less and have relatively less educated mothers. It has been shown that, on average, more educated parents tend to have fewer children. Having more siblings raises the cost of using daycare and lowers the benefits from the mother working outside the home.

The results of the analysis of pretest differences on 17 demographic variables indicate a few differences between the groups as the intervention began. In some cases, these differences favor the more intensive group and in others the less intensive group. For example, the more intensive group had better educated mothers and higher incomes, but the less intensive group had a higher percentage of both

Table 4.3

Comparison of Groups at Pretest on Demographic Characteristics for Jordan Intensity Study

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Age of child in months	50.0	6.8	28	50.3	6.3	25	.88	.04
• Age of mother in years[+]	32.5	4.5	28	32.6	6.6	24	.95	.02
• Age of father in years[+]	35.0	4.2	28	34.9	6.0	24	.68	.02
• Percent male[*][+]	57		28	32		25	.08	.47
• Years of education for mother	12.7	1.9	28	14.2	1.9	25	.01	.79
• Years of education for father	13.8	1.8	26	14.3	2.5	24	.37	.28
• Percent with both parents living at home	100		28	84		25	.25	.32
• Percent of children who are Caucasian[*]	96		28	92		24	.47	.20
• Hours per week mother employed[+]	8.3	14.8	28	17.0	20.4	25	.08	.59
• Hours per week father employed[+]	42.3	17.9	28	38.6	16.6	22	.45	.21
• Percent of mothers employed as technical managerial or above[*]	7.0		28	21.0		24	.16	.40
• Percent of fathers employed as technical managerial or above[*]	36.0		28	52.2		23	.25	.31
• Total household income	$26,821	$8,572	28	$34,380	$23,512	25	.11	.88
• Percent with mother as primary caregiver[*]	100		26	92		26	.50	.19
• Percent of families using daycare on a daily basis[*][+]	32		28	48		25	.25	.32
• Number of siblings[+]	3.1	1.9	28	2.0	1.5	25	.02	.58
• Percent with English as primary language	100		28	100		25	1.00	.00

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[+] Absolute values of the ES are reported.

[^]
$$ES = \frac{\bar{x}\ (\text{more}) - \bar{x}\ (\text{less})}{SD\ (\text{less})}$$

parents living at home and a higher percentage of fathers employed as technical/ managerial level or above. In most cases, the differences were quite small, and only 4 of 17 were statistically significant ($\alpha < .10$). If there is any bias in the random assignment, it would slightly favor the more intensive group. Analysis of covariance, using those variables which were correlated with outcomes and for which pretest differences were largest, was used to adjust for biases that may have existed following random assignment.

Intervention Programs

At the time this research was initiated, the early intervention program of the Jordan School District was mandated to provide services to all children with disabilities, ages 3 to 5 years, who resided within district boundaries. The majority of these children were served in two schools that also served as elementary schools for children without disabilities. Other service options were possible (home services, self-contained school placement, services in a daycare center) according to the needs of the child. Classrooms within the two most populous schools within the district were selected for research involvement. Children in both the less and more intensive programs were located at each school.

To determine whether program intensity was related to outcomes, it was critical that other factors be held as constant as possible. At each school, teachers had morning and afternoon sessions. Two teachers were involved in this study (one per school), and each taught a less and a more intensive classroom. At one school, the less intensive class was a morning class, at the other an afternoon class. This arrangement helped control for differences resulting from factors other than intensity.

One difference in the two schools was that one of the schools (one less and one more intensive condition classroom) used a reverse mainstreaming arrangement to provide services. In this school, regardless of condition, the classrooms were composed of 50% children without disabilities three days per week. The classrooms at the other school were not similarly mainstreamed. Instead, children from different classrooms were brought together for playground and nonacademic activities (e.g., music and art). The classroom at this school also used some peer tutors in the special education classrooms.

Children were initially assessed for early intervention placement by a transdisciplinary team of professionals using norm-referenced assessment measures of general development. These assessment protocols were then forwarded to the teacher for eligible children. Based on this information, the teacher requested and received additional assessment information for speech/language or motor functioning. Once enrolled in the program, the child received a criterion-referenced assessment by the teacher. Information from all these sources was then combined at a meeting, in which the parent participated, to develop an Individual Education Plan (IEP) for the child. The IEP then dictated the specific nature of intervention services for that child.

Each classroom consisted of approximately 15 children. The majority of these children were in this study, but children who were not participating in the intensity comparison could also have been in one of the less intensive classrooms. Each classroom was staffed by one certified teacher who had access to paraprofessional aides, communication therapists, physical and occupational therapists, and a behavior specialist. Access to aides and communication therapists varied by condition as described below. Child need (as per the IEP) dictated access to motor therapists and the behavior specialists, and this was equally distributed across conditions.

Teachers were free to select curricula of their choice, and classroom activities were drawn from different curricula. The primary curriculum for all classrooms can be described as theme-based and developmentally appropriate. It focused on teaching skills embedded in the daily activities. Both the teachers and communication therapists used this approach which focused on naturalistic teaching (c.f., Haring & Innocenti, 1989).

The daily organization of the classrooms was similar, regardless of experimental condition. The teacher established a number of activities that the children alternated through during the day. These activities were either directed by the aides or the teacher. Children rotated through these activities in small groups. Generally, teachers selected a number of themes that were emphasized during a school week. For example, the color green, the shape of a square, and the concept "under" were weekly themes. Large group activities, such as singing and calendar, were scheduled between other activities. Children were provided a snack each day. Children in need of more individualized instruction were pulled from other activities for individual or smaller (2-3 children) group instruction. Individualized instructional activities were usually conducted by the teacher.

Regular evaluation of each child's learning objectives was required as a part of the IEP process. At the beginning and end of the school year, data on objectives were collected daily, weekly, monthly, or bi-annually, dependent on the objective. Specific criteria were set for each objective to guide evaluative activities.

Less intensive intervention program. This program consisted of a 3-days-per-week, 2-hours-per-day intervention service. The teacher:child ratio in the classroom was 1:5, with each classroom being staffed by a certified teacher and two paraprofessional aides. Communication therapy was provided primarily through a consultation model where classroom staff took primary responsibility for goals and implemented activities as appropriate throughout the school day. The communication therapist was in the classroom approximately every other school day. Some children received individualized therapy from the therapist on these days. In contrast to the more intensive intervention program, there was no group communication therapy activity conducted in the less intensive intervention program.

More intensive intervention program. Children in this group received 5-days-per-week, 2-hours-per-day intervention services. The teacher:child ratio in this class was enhanced from the standard program and consisted of a 1:3 ratio; one certified teacher and four paraprofessional aides per classroom. Communication therapy was delivered primarily through a consultation model, but the therapist was allowed more time to work with teachers. The communication therapist was in these classrooms every school day for the two-hour class time. The communication therapist, in addition to consultation and individual therapy, conducted a large group communication activity and conducted snack-time activities such that naturalistic language teaching interventions were included. Communication therapy occurred more often for the more intensive group, and the large group activity was undertaken only in the more intensive group.

Treatment Verification

The information presented in this section includes data that was collected to verify that the alternative interventions were implemented as intended and information to document contextual variables that may have altered the comparability of children and families in the study.

Attendance. One method to verify that the alternative interventions were received was through child attendance data. If one group had attended more regularly than the other, the research could have been significantly compromised. Daily attendance records were kept by teachers, and these were forwarded to EIRI monthly. Regular attendance by subjects in both intensity groups is shown in Table 4.4. It is also clear from the number of days attended that the intensity of intervention was different for the two groups. The length of the school day was equal although number of days of intervention was significantly higher for the more intensive group.

Supervisor ratings of teacher and staff. Teachers and other support staff were evaluated using a structured form at the end of the intervention that was completed by their supervisor (the site contact) regarding their teaching techniques. Teachers and communication therapists at both schools were rated as being in the upper 25% of professionals with whom their supervisor had worked. The respective ratings, based on a 30-point scale, of the teacher and communication therapist were: 30 and 30 for one school; 24 and 28 at the other school.

Parent satisfaction. Another aspect of treatment verification was parent satisfaction with the program. Parent satisfaction was assessed through a seven-question scale completed at the end of the year-long intervention. The results of

Table 4.4

Treatment Verification data for Jordan Intensity Study

Variable	Less Intensive			More Intensive			p Value	ES^
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Percent child attendance	90.0	(9.1)	28	92.5	(5.5)	25	.22	.27
• Number of days attended	98.5	(10.3)	28	165.1	(15.0)	25	.00	6.47
• Parent satisfaction*	23.1	(4.5)	28	24.8	(2.9)	23	.11	.38
Staff working with child	3.8	(0.5)	28	3.8	(0.4)	24	1.00	.00
Ability to communicate w/staff	3.2	(0.8)	28	3.5	(0.6)	24	.17	.38
Program goals/activities for child	3.5	(0.6)	28	3.6	(0.6)	24	.35	.17
Participation in child's program	3.0	(0.9)	28	3.3	(0.8)	24	.31	.33
Services available for child	3.2	(0.9)	28	3.5	(0.6)	23	.16	.33
Child's progress	3.2	(0.9)	28	3.7	(0.6)	24	.04	.56
Child's program	3.3	(0.8)	28	3.6	(0.6)	24	.05	.38
• Teacher rating of parental# attendance	2.3	(0.8)	28	2.3	(0.8)	25	.89	.04
• Teacher rating of parental# knowledge	2.1	(0.8)	28	2.3	(0.8)	25	.52	.18
• Teacher rating of parental#	2.1	(0.7)	28	2.2	(0.7)	25	.64	.13

* Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program. Each question is scored from 1 to 4. Higher scores indicate greater satisfaction.

# Teacher rating is based on a scale with a range of 1-3. Higher scores indicate a better rating.

^ $$ES = \frac{\bar{x}\text{ (more)} - \bar{x}\text{ (less)}}{\text{SD (less)}}$$

this questionnaire are presented in Table 4.4. No group differences were found except on those questions assessing satisfaction with child progress and the general program. Parents in the more intensive group were more satisfied with the progress their child had made and with the program in general. It should be noted that average parent satisfaction in all areas was very high. Differences occurred within a narrow boundary of positive satisfaction.

Teacher ratings of parents. To determine if teachers of children during the one year intervention perceived differences in the skill levels of parents, they were asked to rate each parent regarding parent support of their child, knowledge of the intervention process and their child's development, and attendance at required activities. As shown in Table 4.4, no differences were found between the parents in the two groups on any of these measures. Teacher ratings of parents continued after the initial intervention period as well. The results of questions related to parent knowledge of the child's educational program show a difference, with a p-value of .09 at Reassessment #3 in favor of the more intensive group parents. No differences were found with respect to teacher ratings of parent support of the child's educational program for any of the other posttests.

Child health. The health of those children in the study could have been a disruptive factor affecting child and family outcomes. Parents completed a health questionnaire at Reassessments #1, #2, #3, and #4. Questions regarding a variety of health issues were asked. As shown in Table 4.5, no differences between groups were found on any of these health measures for any of the four reassessments.

Family measures. Other contextual variables include measures of family functioning. Families completed the Family Inventory of Life Events at Pretest and Reassessment #1, the Holmes and Rahe was administered to families at Reassessments #3 and #4, and the Family Adaptation and Cohesion Evaluation Scales was completed at Pretest and Reassessment #1 and #2. Also, the Family Support Scale and the Family Resources Scale were completed at each of the four reassessments. The results of t-tests between the groups on these measures are presented in Table 4.6. Only one of the measures, FACES Cohesion at Pretest, shows a statistically significant difference between the groups. The Effect Sizes indicate that low intensity families did better on some measures where high-intensity families scored better on others. The average ES across all measures is .10. The data suggests the families were similar in most respects as depicted by these measures.

Outside therapies. In a study such as this, it is possible that the parents of children in the less intensive group were supplementing their child's education with private therapies or instruction. Parents were interviewed at Reassessment #1, #2, #3, and #4 to examine this issue, and parents in each group reported any involvement in such supplemental activities. Supplemental hours of speech and motor therapy, are reported in Table 4.5. No statistically significant differences were found on the supplemental activities for Reassessments #1, #2, #3, or #4.

Table 4.5

Treatment Verification Data for Reassessments #1, #2, #3, and #4 for Jordan Intensity Study

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
Reassessment #1								
• General Health of Child♦	2.0	(.6)	28	2.0	(.7)	22	.64	0
• Therapies received outside* school program								
Percent receiving outside** speech therapy	10.7		28	16.0		25	.57	-.14
Percent receiving outside** PT/OT therapy	14.3		28	4.0		25	.20	-.05
Reassessment #2								
• General Health of Child♦	2.1	(.6)	28	2.10	(.6)	25	.94	0
• Therapies received outside* school program								
Percent receiving outside** speech therapy	25.0		28	16.0		25	.43	.19
Percent receiving outside** PT/OT therapy	14.3		28	4.0		25	.20	.28
Reassessment #3								
• General Health of Child♦	2.1	(.6)	26	2.1	(.5)	24	.97	0
• Therapies received outside* school program								
Percent receiving outside** speech therapy	7.1		28	8.0		25	.26	-.04
Percent receiving outside** PT/OT therapy	14.3		28	12.0		25	.81	-.05
Reassessment #4								
• General Health of Child♦	2.2	(.7)	26	2.1	(.5)	25	.68	-.14
• Therapies received outside* school program								
Percent receiving outside** speech therapy	7.1		28	4.0		25	.74	.09
Percent receiving outside** PT/OT therapy	10.7		28	4.0		25	.48	.19

♦ Based on parent rating of the child's health were 1 = worse than peers, 2 = same as peers, 3 = better than peers.

* Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

** Statistical analyses are based on t-tests where those receiving services were scored "1" and those not receiving services "0." ESs are based on a probit transformation of percentage data.

^ $$ES = \frac{\bar{x}\,(\text{more}) - \bar{x}\,(\text{less})}{SD\,(\text{less})}$$

Table 4.6

Comparison of Family Functioning for Jordan Intensity Study

Variable	Less Intensive $\bar{x}$	Less Intensive (SD)	Less Intensive n	More Intensive $\bar{x}$	More Intensive (SD)	More Intensive n	p Value	ES^
PRETEST								
Family Adaptation and Cohesion Evaluation♣ Scales (FACES)								
Adaptation	24.5	(4.7)	28	26.1	(4.6)	24	.21	.34
Cohesion	39.0	(4.3)	28	41.8	(5.0)	24	.03	.65
Family Inventory of Life Events and Changes (FILE)**	9.8	(5.1)	28	11.4	(7.9)	25	.40	-.30
Family Resource Scale (FRS)♠ (range 30 to 150)	116.1	(15.3)	28	122.8	(20.2)	25	.18	.44
Family Support Scale (FSS)@	2.1	(0.7)	28	2.1	(0.7)	23	.99	.00
REASSESSMENT #1								
Family Adaptation and Cohesion Evaluation♣ Scales (FACES)								
Adaptation	25.7	(4.4)	28	24.0	(4.2)	25	.15	-.39
Cohesion	40.0	(3.5)	28	42.0	(6.0)	25	.15	.57
Family Inventory of Life Events and Changes (FILE)**	9.6	(5.5)	28	8.9	(6.5)	25	.68	.13
Family Resource Scale (FRS)♠	123.0	(15.4)	28	125.3	(17.1)	25	.61	.15
Family Support Scale (FSS)@	2.0	(0.8)	28	2.1	(0.9)	24	.81	.13
REASSESSMENT #2								
Family Adaptation and Cohesion Evaluation♣ Scales (FACES)								
Adaptation	25.6	(5.7)	28	24.9	(4.6)	25	.62	-.12
Cohesion	40.0	(4.1)	28	41.6	(5.7)	25	.25	.39
Family Resource Scale (FRS)♠	122.0	(12.8)	28	119.1	(20.7)	25	.55	-.23
Family Support Scale (FSS)@	1.9	(0.7)	27	2.0	(0.8)	24	.80	.14
REASSESSMENT #3								
Major Life Events**	130.7	(144.6)	27	183.1	(119.0)	25	.16	-.36
Family Resource Scale♠	128.1	(13.9)	27	124.1	(16.0)	25	.35	-.29
Family Support Scale@	2.0	(0.7)	28	1.8	(0.8)	25	.47	-.29

(continued)

** The Holmes and Rahe and the FILE are based on raw scores where lower scores are considered better.

♣ Scores for each subscale of the FACES are based on linear scoring, where high scores are preferred.

♠ Analyses for the FRS is based on raw scores where higher scores indicate greater resources

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, the numerator for the ES is calculated as Less Intensive minus More Intensive as lower scores are preferred.

@ Analyses for the FSS is based on a total score calculated by dividing the sum of perceived support by the total number of sources. Higher scores are considered better.

Table 4.6 (continued)

Comparison of Family Functioning for Jordan Intensity Study

Variable	Less Intensive			More Intensive			p Value	ES^
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
REASSESSMENT #4								
Holmes and Rahe**	168.6	(156.2)	28	145.1	(78.8)	24	.49	.15
Parent Self-Awareness Scale	41.9	(6.4)	28	42.5	(8.4)	25	.79	.09
Family Resource Scale (FRS)♠	125.0	(12.0)	28	123.8	(16.8)	25	.78	-.10
Family Support Scale (FSS)@	2.1	(0.7)	28	2.1	(0.9)	25	.71	.00

** The Holmes and Rahe and the FILE are based on raw scores where lower scores are considered better.

♣ Scores for each subscale of the FACES are based on linear scoring, where high scores are preferred.

♠ Analyses for the FRS is based on raw scores where higher scores indicate greater resources

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, the numerator for the ES is calculated as Less Intensive minus More Intensive as lower scores are preferred.

@ Analyses for the FSS is based on a total score calculated by dividing the sum of perceived support by the total number of sources. Higher scores are considered better.

Site review. A major source of treatment verification information came from a site review conducted during the first year of the study. The purposes of this review were to (a) collect information about the nature and quality of early intervention services that were being delivered, (b) verify that the research being conducted by EIRI was being implemented as intended, and (c) collect assessment data that may have been useful to site administrators to guide internal changes and for use when seeking technical assistance. Purpose (a) and (b) were relevant to treatment verification.

The review was conducted by a team consisting of: (a) the EIRI staff person; (b) the Jordan District site contact; (c) the Preschool Specialist for the Utah State Office of Education; and (d) a Professor of Special Education at the University of Utah. The site review was structured by the EIRI-developed Treatment Verification Guide. (A copy of the site review report and treatment verification guide can be obtained from EIRI.)

Site review findings indicated that the Jordan School District Early Intervention Program was delivering appropriate, quality intervention services. Variables that distinguished different intensities of programs were being fully implemented. The less and more intensive classrooms were clearly distinct with respect to student: teacher ratios, number of days per week the intervention occurred, and frequency of speech and language therapy. Staff of the Jordan Preschool were qualified, enthusiastic professionals whose goal was to provide quality services to preschool-aged children with disabilities. Teachers were commended on use of developmentally appropriate classroom activities and naturalistic teaching strategies. The program was competently administered and had in place a well-developed procedures manual. The program-developed transition procedures for information transfer were excellent. Minor suggestions for improvement were made regarding: daily lesson plans, data collection, IEP development, assessment for program entrance, and training for aides. No threats to the validity of the research study were found.

Ecobehavioral assessment. Another source of treatment verification information came from an ecobehavioral assessment of classroom activities. A concern with this intervention was whether classroom contexts and teacher behaviors varied for classrooms of different intensity. It is possible that time differences (hours/week) may not result in actual program intensity differences. For example, Carta, Sainato, and Greenwood (1988) examined preschool programs and found two programs that operated for different lengths of time, but where the instructional intensity was virtually equivalent. To account for possibilities such as this, an ecobehavioral observation instrument was used.

Ecobehavioral observation assesses program variables through systematic observation and measures moment-to-moment effects of the interaction between environment (classroom contexts), teacher behavior, and student behavior (c.f., Carta et al., 1988). The Ecobehavioral System for Complex Assessment of the Preschool

Environment (ESCAPE; Carta, Greenwood, & Atwater, 1986) was used for this observational assessment.

The ESCAPE was designed for use in preschool environments that serve students with disabilities. The ESCAPE assesses three major features of preschool early intervention programs: (1) the program ecology, (2) the behavior of teachers, and (3) the behavior of student participants. These three major categories are subdivided into 12 subcategories (see Table 4.7). All variables are recorded on a 15-second momentary time-sampling system where all categories are scored over a one-minute period. Each subcategory is examined and scored within a 15-second time period.

ESCAPE observations were conducted near the end of the first year. Each child was observed for three 10-minute samples, distributed across different days and time periods. Observations were conducted on all children in all classrooms. The only exception was one more intensive intervention subject who left school before observations were conducted.

To assess the reliability of the observation system, two observers recorded data concurrently and independently for 25% of the samples. Agreement between observers, calculated as the percentage of intervals in which both observers selected the same category for a particular variable, averaged 95% across variables, with a range from 86% to 100%.

Results from the ecobehavioral observation are presented in Table 4.8. This table presents results of teacher engagement and grouping of students in the classroom. Engagement values are determined based on a child's behavior across all student behavior categories during a single interval. Appropriate engagement is hypothesized to be the primary behavior contributing to child development (Carta et al., 1988; Greenwood, 1991; Greenwood, Delquadri, & Hall, 1984; Innocenti, 1990).

Teachers, overall, responded similarly to children in both groups. Most importantly, levels of appropriate engagement were similar between the groups. These

Table 4.7

ESCAPE Variable and Categories Within Variables for Jordan Intensity Study

Ecology Variables

A. **Designated Activity**
The overall format on structure of the activity in which the teacher has placed the target child.

Snack
Fine Motor
Story
Play
Music/Dance/Recitation
Self-Care
Transition
Clean-up
Gross Motor
Preacademics
Class Business
Time Out
Language Programming

B. **Activity Initiator**
The person who selected the activity in which the target child was engaged.

Teacher
Child
No one

C. **Materials**
Objects with which the target child is engaged or attending to

Large Motor Equipment
Manipulatives
Bathroom
Art/Writing
Story Books
None
Instructional
Audio-Visual
Other
Pretend Play Toys
Food or Food Preparation

D. **Location**
The physical placement of the child.

On Floor
At Table
In Chair
On Equipment
In Line
Undefined

E. **Grouping**
Solitary
One teacher with one student
Small Group
Large Group

F. **Composition**
Mix of handicapped and nonhandicapped student within a group.

All handicapped
Equal
Majority nonhandicapped
Majority handicapped
None

Teacher Variables

G. **Teacher Definition**
Primary adult with whom the target child is interacting.

Teacher
Ancillary Staff
Aide
Substitute Teacher
Student Teacher
No Staff
Volunteer

H. **Teacher Behaviors**
Physical Assisting
Prompting
Gesturing/Signing
Verbal Instruction
Approval
Reading Aloud/Singing/Recitation
Disapproval
Discussion
Verbal No Response

I. **Teacher Focus**
The direction of the behavior of the coded adult.

Target child only
Target child and others
No one
Other than target child

Student Variables

J. **Target Behaviors**
Behaviors that indicate student attention, engagement, and for participation.

Academic Work
Gross Motor Behaviors
Transition
Pretending
Singing/Reciting/Dancing
Attention
Manipulating
Self-care
None

K. **Competing Behaviors**
Behaviors which are commonly considered to be unacceptable.

Acting-out
Off-task
Self-stimulation
None

L. **Verbal Behavior**
Verbal or signed expression.

Talk to Teacher
Talk to Peer
Undirected
No Talk

Table 4.8

Percentage of Time in Categories Observed by the ESCAPE for the Jordan Intensity Study

Variable	Less Intensive $\bar{x}$	Less Intensive (SD)	Less Intensive n	More Intensive $\bar{x}$	More Intensive (SD)	More Intensive n	p Value	$\hat{ES}$
· Grouping								
Small Group	24.8	26.4	28	38.6	24.7	24	.06	.52
Large Group	71.0	27.1	28	52.8	24.8	24	.02	-.67
1 Teacher w/1 Student	1.5	3.7	28	2.7	8.0	24	.51	.32
Solitary	2.7	5.0	28	4.1	6.0	24	.36	.28
· Engagement								
Appropriate Engagement	42.2	19.6	28	43.2	18.6	24	.86	.05
Appropriate Not Engaged	30.8	17.3	28	29.3	16.1	24	.76	-.09
Appropriate Engagement w/Other Behavior	24.7	15.8	28	23.9	11.2	24	.84	-.05
Appropriate-Not Engaged w/Other Behavior		2.2	3.8	28	2.9	4.8	24	.548

$$\hat{ES} = \frac{\bar{x}\text{ (more)} - \bar{x}\text{ (less)}}{\text{SD (less)}}$$

results suggest that the time of the children in both groups was spent engaged in very similar activities.

The major difference between the two groups was that the children in the more intensive classroom engaged in these activities for more hours per week than the children in the less intensive group. Also, subjects in the more intensive group spent significantly more time in small groups, while the less intensive children were in large groups more often. The intensity differences were designed to provide a higher teacher:child ratio for the time that subjects were engaged; the data in the grouping category suggests that the objective was achieved.

Cost of Alternative Interventions

The cost analysis for this study was conducted during the 1988-89 school year. Costs are based on those classrooms involved in the study (two less intensive, two more intensive). Cost estimates are based on a class of 15 students. Even though the number of subjects for the study was not 15 per class in all classes, classes were designed for 15 students. Cost data were obtained using the ingredients approach, a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs. It includes costs that are often omitted from cost analysis such as shared resources. As shown in Table 4.9, each alternative used direct service and administrative personnel, occupancy, equipment, transportation, and materials and supplies in varying amounts according to the intensity of program. Cost estimates on Table 4.9 are in 1990 dollars.

Table 4.9

Cost Per Child for Jordan Intensity Study

Resources	Less Intensive	More Intensive
Agency Resources		
Direct Services	$1,709	$3,570
Administration		
Preschool	623	623
District	35	59
Occupancy	294	502
Equipment	71	119
Transportation		
Children	405	676
Staff	14	22
Materials/Supplies	52	87
TOTAL	***$3,203***	***$5,658***

Direct service personnel included a teacher, a speech and language therapist, a physical therapist, an occupational therapist, and two aides in each class. Full-time equivalent (FTE) converts time spent on the project to a full-time base. It allows comparisons between personnel by converting their time spent to a common metric. The same staff conducted the five-day intervention with the addition of two aides. Of course, direct service staff reported devoting more of their total FTE to the five-day program. The salaries and benefits for direct service personnel were determined according to their FTE devoted to each program alternative.

Preschool administrative personnel included salaries and benefits for the program director and a secretary. Interestingly, they reported spending approximately the same proportion of FTE on administrative duties for both programs. District administration includes the school principal, the special education director, and other necessary district administration, as well as the bus drivers and bus aides. The administrative cost of operating the program on the district level was calculated according to the district's indirect rate for operating federal programs (1.1%). Occupancy charges, including space, maintenance, utilities, and insurance costs were based on the school district leasing cost of $6 per square foot per year. One thousand thirteen square feet were allocated for the three-day program, and 1,688 square feet for the five-day program. Annual equipment cost was determined by taking inventory of all instructional materials, office furniture, and equipment. Market replacement values were then applied to each item, costs were annualized accounting for interest and depreciation, and prorated according to usage by each alternative.

Child transportation included fuel, maintenance, depreciation, and annualized cost of car seats/restraints. As previously noted, the cost for drivers, bus aides, and transportation administration are included under "administration." Staff travel was based on actual mileage (at $.205 per mile) for the teachers and therapists travel related to the respective intervention programs. The cost of materials and supplies were assessed based on actual usage of these items by each alternative.

Data Collection

The data collected for this study were collected to assess the effects of intervention not only on the children, but also on their families. As noted earlier, Pretest data and data from Reassessments #1, #2, and #3 have been collected. The instruments used to obtain data on children and their families and the reassessment administration information on these instruments is presented in Table 4.10. A brief description of each of these instruments is presented in Table 4.11.

Table 4.10

Schedule of Administration and Tests Administered for Jordan Intensity Study

	Pretest	Reassessment #1	Reassessment #2	Reassessment #3	Reassessment #4
CHILD MEASURES					
Battelle Developmental Inventory	X	X	X		
Woodcock-Johnson Tests of Achievement				X	X
Social Systems Rating Scale				X	X
Cooper Farran Behavior Rating Scale		X	X		
Scales of Independent Behavior				X	X
Joseph Preschool/Primary Self-Concept Inventory			X	X	
Perceived Competence and Social Acceptance				X	X
Developmental SPECS		X	X	X	X
FAMILY MEASURES					
Outcomes:					
Parent Stress Index	X	X	X		
Parent Stress Index Short Form					X
Comprehensive Evaluation of Family Functioning					X
Contextual Variables:					
Family Support Scale	X	X	X	X	X
Family Resource Scale	X	X	X	X	X
Family Inventory of Life Events and Changes	X	X			
Family Adaptation and Cohesion Evaluation Scales		X	X	X	
Parent Self-Awareness Scale				X	X
Major Life Events				X	X

Table 4.11

Description of Tests Administered for Jordan Intensity Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Woodcock-Johnson Tests of Achievement (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of nine aspects of scholastic achievement: Letter-word Identification, Passage Comprehension, Calculation, Applied Problems, Dictation, Writing Samples, Science, Social Studies, and Humanities.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1985)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: motor skills, social and communication skills, personal living skills, and community living skills.
Joseph Preschool and Primary Self-Concept Screening Test (JSI) (Joseph, 1979)	Assesses the self-concept of children ages 3.6 to 9.11 years via responses to line drawings. It provides a global self-concept score.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: communication, sensorimotor, physical, self-regulation, cognition, and self-social.
Social Skills Rating Scale (SSRS) (Gresham & Elliott, 1990)	A norm-referenced measure of child social skills and school success. Ratings are obtained from the child's parent and teacher.
Perceived Competence and Social Acceptance (Harter & Pikes, 1983)	A pictorial scale of perceived competence and social acceptance for young children that assesses four domains: cognitive competence, physical competence, peer acceptance, and maternal acceptance.
Cooper Farran Behavioral Rating Scales (Cooper & Farran, 1988)	Assesses the classroom behavior of students as it relates to interpersonal skills and work-related skills. Teachers provide information on student's performance on each of 39 dimensions.
FAMILY MEASURES	
Parent Stress Index (PSI) PSI Short Form (Abidin, 1986)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.

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Table 4.11 (continued)

Description of Tests Administered for Jordan Intensity Study

MEASURES	DESCRIPTION
Comprehensive Evaluation of Family Functioning (CEFF) (McLinden, 1989)	Assesses areas in which a family having a child with special needs may be affected. Areas assessed are: time demands, acceptance, coping, social relationships, financial demands, well-being, and sibling relationships.
Parent Self-Awareness Scale (PSAS) (Snyder, Weildreyer, Dunst, & Cooper, 1985)	Assesses parent perceptions of empowerment in the areas of decision making, obtaining information, and in interactions with self and others.
Holmes & Rahe Major Life Events (Holmes & Rahe, 1967)	Assesses parent stress resulting from major life events that occurred within the past year.

Recruitment, training, and monitoring of diagnosticians. Diagnosticians who were recruited for the study successfully completed certification procedures required for the Battelle Developmental Inventory at Pretest, Reassessment #1 and Reassessment #2, and for the Woodcock Johnson and Scales of Independent Behavior at Reassessments #3 and #4. Testers were recruited through the Early Intervention Research Institute at Utah State University. Only testers who were "blind" as to the group membership of children participating in the study were recruited. All diagnosticians had a minimum of a Bachelor's Degree and experience working with young children with disabilities. Certification included an extensive in-service on BDI, Woodcock Johnson Revised and SIB administration and scoring. Prior to collecting data for the study, each examiner was required to administer a minimum of three assessments, two of which were observed for quality control. Further, each examiner was "shadow scored" for reliability at least once during each test period. For Reassessment #1, an average of 9% of all tests were "shadow scored," watched and scored by another certified tester, for interrater reliability. Average agreement was 90% and ranged from 77 to 100%. Eleven percent of all tests were shadow scored for Reassessment #2, and average agreement was 91% with a range of 84 to 97%. Reassessment #3 resulted in average agreement equal to 96% for the Woodcock-Johnson, with the range from 87%

to 100% and averaged 98% for the SIB, with a range of 94% to 100%. Reassessment #4 reliability averaged 99% with 9% of all tests shadow scored.

For Reassessment #1, Josephs were administered by a graduate student in the School Psychology Program at the University of Utah. The site coordinator provided training on the Joseph prior to the first administration. Children were administered the Joseph during their school day. Reassessment #2 Josephs and Reassessments #3 and #4 Perceived Competence and Social Acceptance measures were administered by the same diagnosticians who gave the Battelle and Woodcock-Johnson, respectively. Each examiner received training in the Self-Concept measure from the site coordinator and the assessment coordinator prior to administration.

Pretest. Pretest data were collected at the beginning of the academic year. Parents and subjects completed a core pretest battery of assessment measures that were common across sites, including the Battelle Developmental Inventory (BDI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Scales (FACES III). Family functioning has been an overlooked variable in early intervention research (Casto & Mastropieri, 1986; Dunst, 1986). Although theoretically, it is assumed early intervention will affect families (Bronfenbrenner, 1979), the specific areas that may be impacted are unknown and may vary depending on the type of intervention. The battery of family functioning measures used here will help to elucidate areas of functioning that may be affected by different intensities of intervention. Parents also provided demographic information at Pretest. More information on these measures can be found in Table 4.11 and in the Final Report of the Longitudinal Studies of the Effects of Costs of Early Intervention for Handicapped Children (White, 1991).

Reassessment #1. All 53 children in the study were administered their first posttest at the end of the first academic year (May and June). Measures administered were shown earlier in Table 4.10. In addition, parents also provided information on aspects of treatment verification such as ratings of satisfaction with the intervention program.

Reassessment #2. The second posttesting was completed in June, 1990. The measures described earlier were administered to all 53 children who completed intervention.

Reassessment #3. Reassessment #3 assessment was completed for 53 children as of June 1991. At Reassessment #3, the mean age of children in the study was 81 months. Several children in the study were approaching the upperbound of the age limit for the BDI, so the Woodcock Johnson (W-J) and Scales of Independent Behavior (SIB) were administered to all children in the study for Reassessment #3 instead of the Battelle Developmental Inventory. The SPECS was administered to teachers and parents as in the previous two posttests. At this posttest, changes were made in some of the family measures as well. The PSI and FACES were dropped, although the FRS and FSS were completed by parents. In addition, the Social Systems Rating Scale (SSRS), Parent Self-Awareness Scale (PSAS), Comprehensive Evaluation of Family Function (CEFF), and the Major Life Events were given to parents of subjects in the study. At Reassessment #3, the Peer Acceptance and Social Competence measure was used in place of the Joseph.

Reassessment #4. Reassessment #4 was completed in June 1992 for all 53 children and families in the study. The Woodcock-Johnson, SIB, and Peer Acceptance and Social Competence measure of self-concept were used as measures of child outcomes as in the previous assessment. The SPECS was administered to teachers. Families completed the PSI short form, FRS, FSS, SSRS, PSAS, and the Major Life Events.

Results and Discussion

Thus far, data have been collected one, two, three, and four years after the intervention was initiated. Children participated in the different intensities of intervention for only one year. The results of Reassessment #1 represent an immediate test of the effects of the different intensity of services provided to children in the study. Reassessments #2, #3, and #4 are a follow-up to the intensity question and will provide information regarding whether differences between groups appear some time after treatment and whether initial differences are maintained through time. First, the comparability of groups at pretest will be presented. The results of the posttest child functioning analysis follow and then the results of the posttest family measures are presented. Finally, educational placement and cost results are outlined.

Comparability of Groups on Pretest Measures

The comparability of groups on demographic characteristics was presented in Table 4.3 and discussed earlier. Statistically significant differences were observed for 4 of 17 variables in those comparisons. Group differences on family and child pretest measures are presented in Table 4.12. Using the same cut-off value for assessing statistical significance as in the demographic analysis ($\alpha \leq .10$), subjects were comparable on all BDI domains, on the BDI Total score, and for chronological age at pretest. This is supported by the average ES across child and family measures, which equals .06. On measures of parent and family functioning, no statistically significant group differences were found. For all measures of family functioning, including the measures that would suggest differences in the areas of family stress and available family support systems, the two groups were not statistically significantly different when they entered the study. Overall, these data suggest that the groups were comparable on child and family functioning measures at pretest.

Table 4.12

Comparability of Groups on Pretest Measures for Jordan Intensity Site

Variable	Less Intensive			More Intensive			p Value	ES&
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Age in months at pretest	50.0	6.8	28	50.3	6.3	25	.88	.04
• Battelle Developmental Inventory (BDI)								
Personal Social	98.4	(22.2)	28	97.2	(19.6)	25	.84	-.05
Adaptive Behavior	65.1	(14.9)	28	68.1	(10.0)	25	.40	.20
Motor	92.6	(18.6)	28	95.8	(14.1)	25	.49	.17
Communication	48.3	(12.4)	28	47.4	(9.4)	25	.78	-.07
Cognitive	39.6	(10.5)	28	39.9	(10.1)	25	.91	.03
TOTAL	344.0	(64.5)	28	348.4	(48.1)	25	.78	.07
• Parenting Stress Index (PSI)**								
Total (range 101 to 504)	237.5	29.9	28	233.7	55.4	25	.75	.13
Child Related (range 54 to 270)	112.5	17.9	28	114.6	30.3	25	.78	-.12
Other Related (range 101 to 504)	125.0	19.1	28	119.1	30.1	25	.39	.31
• Family Support Scale (FSS)^ Total Score (range 0 to 4)	2.1	.7	28	2.1	.7	25	.99	.0

* Statistical analysis for BDI scores was conducted using raw scores for each of the scales.

^ Analyses for the FSS are based on raw scores indicating number of supports or resources reported as being available. Higher scores are considered better. The score presented represents the sum of perceived support divided by the number of reported sources.

** The PSI is based on raw scores where lower scores are considered better.

& Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, and FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

Analysis of Family and Child Functioning For Reassessments #1, #2, #3, and #4

Effects for the measures of family and child functioning were obtained using an analysis of covariance procedure completed on SPSS-PC. Analysis of covariance procedures were used to increase the statistical power of the study by reducing error variance and to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis.

All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. For example, BDI pretest personal/social score and FACES adaptation scores were used as covariates for 12-month Cooper Farran Interpersonal Social Skills Scores. The combination of these variables reduced the amount of unexplained variance in the 12-month Cooper Farran scores better than other combinations of pretest and demographic variables. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $\alpha \leq .10$, and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977), in those cases where a covariate or set of covariates could be found which correlated with the dependent variable in question at least .70 (which was almost the case in these analyses), and with alpha set at $\alpha \leq .10$, the statistical power was approximately 97% for finding moderate sized differences (defined by Cohen as differences of a half a standard deviation).

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Reassessment #1. Twenty-three child functioning variables were examined and are presented in Table 4.13. Nine of the child functioning measures were statistically significant ($\alpha \leq .10$). Seven of the nine significant measures favored the more intensive group and three of these measured sensorimotor development. The BDI cognitive and total scores also favored the experimental subjects as did the Teacher ratings of general and physical development. However, parent ratings of general development favored the less intensive group, which contradicts some of the teacher ratings and BDI scores.

The CFBRS measure of Interpersonal Skills demonstrated statistically significantly better personal/social skills for subjects in the less intensive group as demonstrated in classroom situations. The CFBRS finding in the area of interpersonal skills is not reflected by the BDI personal/social domain. This may have occurred because the teacher completed the CFBRS, whereas the parent reported on personal/social skills for the BDI. However, parents rated children in the more intensive program more negatively on subscales of the PODS that are most closely related to the BDI personal/social subscale. Only Parent PODS measure of general development was statistically significant and favored the less intensive group subjects.

The results from the first year reassessment suggest that the more intensive intervention resulted in higher motor functioning and may have resulted in higher cognitive and overall development. The majority of the effect sizes (16 of 23) are positive and favor the more intensive group, although 30% are negative. Also, given the additional communication therapy provided to children in the more intensive intervention, differences in communication functioning would be expected and were not observed.

Reassessment #2. Examination of the same measures of child functioning as evaluated for Reassessment #1 reveals that fewer differences existed one year later. The p values, presented in Table 4.14, at $\alpha \leq .10$ suggest only two differences between the subjects in the two different levels of intensity. The Cooper-Farran Behavior Rating Scale (CFBRS) measure of Interpersonal Social Skills and the Parents'

Table 4.13

Reassessment #1 Results of Child Functioning for Jordan Intensity Study

Variable[*]	Covariates[+]	Less Intensive				More Intensive				ANCOVA F	P Value	ES[^]
		$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n			
Average length of intervention in days	---	109.	2.5	--	28	178	11.4	--	25	977.5	.00	27.6
Average length of intervention in months	---	9	00	--	28	8.88	.60	--	25	1.12	.29	.0
Age in months at posttest	---	57	6.8	--	29	57	7.9	--	25	0.10	.75	.0
Battelle Developmental Inventory												
Personal Social	1	110.4	(27.0)	109.8	28	114.4	(22.7)	115.0	25	1.74	.19	.19
Adaptive Behavior	2	72.4	(14.9)	73.7	28	76.7	(9.8)	75.4	25	.93	.34	.11
Motor	3	98.5	(20.1)	100.1	28	106.4	(18.1)	104.7	25	3.98	.05	.23
Communication	4	54.6	(16.0)	54.1	28	54.4	(13.1)	54.9	25	.11	.74	.05
Cognitive	5	44.9	(12.2)	45.0	28	48.4	(11.8)	48.3	25	3.88	.05	.27
TOTAL	6	380.6	(73.0)	383.0	28	400.3	(57.9)	397.9	25	4.85	.03	.20
Joseph TOTAL	4	17.3	(3.1)	17.3	28	18.2	(5.3)	18.3	24	.90	.35	.32
Cooper-Farran Behavior Rating Scale (CFBRS)												
IPS	1,7	5.5	(.6)	5.4	23	4.9	(.8)	5.0	20	4.67	.04	-.67
WRS	6	3.8	(1.0)	3.9	28	3.8	(1.0)	3.8	23	.04	.85	-.10
Perceptions of Dev. Status (PODS) by Teacher												
General Development	6	2.9	(.9)	2.9	28	3.2	(.6)	3.2	23	4.48	.04	.33
Communication	5	3.2	(.7)	3.2	28	3.3	(.6)	3.3	25	.47	.50	.14
Sensorimotor	3	3.9	(.6)	4.0	28	4.4	(.4)	4.3	25	15.74	.00	.50
Physical	3	3.9	(1.0)	3.9	28	4.2	(.6)	4.2	23	4.94	.03	.30
Self Regulation	6	3.5	(.9)	3.5	28	3.6	(1.0)	3.6	23	.22	.64	.11
Cognition	5	2.7	(1.0)	2.7	28	3.0	(.8)	3.0	25	1.43	.24	.30
Self-Social	6	3.2	(1.0)	3.2	28	3.5	(.8)	3.5	25	2.03	.16	.30
Parent PODS												
General Development	6	3.6	(.8)	3.6	28	3.3	(.7)	3.2	24	2.85	.10	-.50
Communication	1,8,9	3.6	(.6)	3.5	28	3.6	(.7)	3.7	24	2.75	.10	.33
Sensorimotor	3	4.1	(.5)	4.2	28	4.4	(.4)	4.4	23	5.54	.02	.40
Physical	2	4.3	(.5)	4.4	28	4.4	(.5)	4.3	24	.02	.90	-.20
Self Regulation	1	4.0	(.6)	4.0	28	3.9	(.8)	3.9	24	.52	.48	-.17
Cognition	1,7,8	3.6	(.8)	3.6	28	3.5	(.8)	3.5	24	.05	.82	-.13
Self-Social	6	3.9	(.5)	3.9	28	3.8	(.8)	3.7	24	.83	.37	-.40

[*] Statistical Analysis for assessment instruments was conducted using raw scores for each of the scales and these are presented.

[^] Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[+] Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = FACES Adaptation, 8 = PSI Child Related, 9 = Mothers year of Education.

Perceptions of "Self-Social" Developmental Status were statistically significant in favor of the less intensive group.

None of the differences which favored the more intensive group at Reassessment #1 appeared for the same measures at Reassessment #2. The BDI motor, BDI cognitive, BDI Total, and teacher and parent SPECS sensorimotor differences measured at Reassessment #1 have disappeared. The teacher completed CFBRS measure of Interpersonal Skills provided evidence that the less intensive group still had better personal-social skills in the classroom, although they did not have better work-related skills.

Table 4.14

Reassessment #2 Measures of Child Functioning for the Jordan Intensity Study

Variables	Covariates+	Less Intensive				More Intensive				ANCOVA F	P Value	ES^
		x̄	(SD)	Adj. x̄	n	x̄	(SD)	Adj. x̄	n			
Average length of intervention in days	----	109.0	(2.5)	---	28	178.0	(11.4)	---	25	977.5	.0	27.6
Average length of intervention in months	----	9.0	(0.0)	---	28	8.8	(.6)	---	25	1.1	.29	.0
Age in months at posttest	----	68.9	(6.9)	---	28	69.8	(6.7)	---	25	1.1	.62	.13
Battelle Developmental Inventory												
Personal/Social	1	133.2	(28.6)	132.6	28	131.0	(23.3)	131.5	25	.05	.82	-.04
Adaptive Behavior	2,9	84.0	(16.2)	85.6	26	83.7	(13.1)	82.1	23	1.14	.29	-.22
Motor	3,10	113.6	(28.4)	116.0	28	122.0	(21.4)	119.6	25	1.49	.23	.13
Communication	4,11	66.2	(18.6)	64.8	28	63.7	(13.3)	65.1	23	.01	.92	.02
Cognitive	5	61.1	(23.2)	61.3	28	58.3	(16.1)	58.1	25	.97	.33	-.14
TOTAL	6	458.1	(99.0)	460.9	28	460.5	(69.2)	457.7	25	.07	.79	-.03
Joseph TOTAL	6,12	23.1	(6.0)	23.0	28	21.7	(5.5)	21.9	23	.69	.41	-.18
Cooper-Farran Behavior Rating Scale (CFBRS)												
IPS	6	52.1	(10.7)	52.2	28	46.1	(14.5)	46.0	23	4.05	.05	-.58
WRS	6	37.3	(12.0)	37.5	28	37.7	(12.6)	37.5	23	.00	.98	.00
Perceptions of Develop. Status by Teacher												
Communication	5,11	6.5	(1.6)	6.4	28	6.3	(1.4)	6.5	21	.06	.81	.06
Sensorimotor	3	16.1	(2.2)	16.2	28	16.8	(2.2)	16.7	23	1.12	.30	.23
Physical	3,8	12.5	(2.1)	12.8	28	12.9	(2.2)	12.6	23	.17	.68	-.10
Self Regulation	11	15.1	(3.3)	14.9	28	14.0	(4.1)	14.3	21	.33	.57	-.18
Cognition	5,11	6.0	(2.5)	5.9	28	6.1	(1.9)	6.2	21	.41	.53	.12
Self-Social	6,12	13.1	(3.9)	12.9	28	13.7	(4.1)	13.9	23	1.33	.26	.26
Perceptions of Develop. Status by Parent												
Communication	5	7.5	(1.6)	7.5	28	6.7	(1.2)	6.7	23	5.14	.03	-.50
Sensorimotor	3	17.6	(2.0)	17.8	28	17.9	(1.4)	17.8	24	.01	.94	.00
Physical	3,9,13	13.3	(1.1)	13.3	27	13.4	(1.4)	13.4	23	.27	.61	.09
Self Regulation	7	16.1	(2.6)	16.3	28	15.1	(2.7)	14.9	24	3.53	.07	-.54
Cognition	5,11,12	7.8	(1.6)	7.6	28	7.1	(1.8)	7.3	24	.75	.39	-.19
Self-Social	6,14	16.1	(2.2)	16.3	27	15.2	(3.2)	15.1	20	3.94	.05	-.55

* Statistical Analysis for assessment instruments was conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

+ Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 14 = FRS Total, 8 = Number of Siblings Living at Home, 9 = Highest Degree Completed by Father, 10 = Adults in home attending school, 11 = Occupation of Father, 12 = Hours in Daycare, 13 = Income, 14 = Hours Worked by Father.

Reassessment #3. Of the 28 measures of child functioning presented in Table 4.15, the more intensive group scored higher on 22, and the less intensive group scored higher on 6. Five scores showed statistically significant differences (α ≤ .10) between the groups. Of these, four favored the more intensive group (the teacher SPECS sensorimotor score, the Scales of Independent Behavior motor skills, personal living skills, and total score) and one favored the less intensive group (the parent evaluation of problem behaviors from the SSRS). The SIB motor skills result was consistent with the Teacher SPECS sensorimotor score (α ≤ .01), the Parent SPECS, showed no statistically significant difference between the groups.

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Table 4.15

Reassessment #3 Measures of Child Functioning for the Jordan Intensity Study

Variable[*]	Covariates[+]	Less Intensive				More Intensive				ANCOVA F	p Value	ES[^]
		$\bar{x}$	(SD)	Adj$\bar{x}$	n	$\bar{x}$	(SD)	Adj$\bar{x}$	n			
• **Woodcock-Johnson Revised Achievement Raw Scores for:**												
Broad Knowledge Total	1,2	452.2	(23.0)	452.2	28	451.4	(15.7)	451.4	25	.05	.83	-.03
Skills Knowledge Total	1,2	400.4	(45.6)	400.7	28	411.3	(29.1)	410.9	25	1.88	.18	.22
• **Scales of Independent Behavior**												
Motor	3,4	448.4	(29.3)	447.1	28	459.0	(22.4)	460.2	25	4.04	.05	.45
Social/Communication	4,5,6	454.0	(20.6)	454.9	28	457.6	(11.9)	456.7	25	.24	.63	.09
Personal Living	3,4	460.6	(16.3)	460.0	28	466.4	(12.2)	467.0	25	5.01	.03	.43
Community Living	3,4	438.4	(23.8)	438.3	28	443.2	(17.4)	443.3	25	1.39	.24	.21
Total	3,4,5	450.5	(18.7)	450.1	28	456.6	(13.1)	457.0	25	4.79	.03	.37
• **Parent Developmental SPECS**												
Communication	4,5,7	7.4	(1.2)	7.3	27	7.3	(1.2)	7.4	25	.12	.73	.08
Sensorimotor	3,4	17.4	(2.2)	17.3	27	17.8	(1.6)	17.8	25	1.05	.31	.23
Physical	3,5,6	13.0	(1.6)	13.0	27	13.2	(1.4)	13.1	25	.04	.85	.06
Self-Regulation	4,5,7	16.2	(2.4)	16.0	27	15.2	(3.5)	15.4	25	.93	.34	-.25
Cognition	4,5,7	7.3	(1.6)	7.1	27	7.6	(1.7)	7.7	25	2.47	.12	.38
Self-Social	4,5,7	15.9	(2.8)	15.7	27	15.2	(3.1)	15.4	25	.13	.72	-.11
• **Teacher Developmental SPECS**												
Communication	5,7	6.5	(1.5)	6.4	26	8.0	(6.1)	8.0	24	1.76	.19	1.07
Sensorimotor	8	15.4	(2.2)	15.6	26	17.3	(2.0)	17.1	24	10.92	.01	.68
Physical	3,4,9	12.3	(2.0)	12.2	26	12.8	(1.8)	12.9	24	1.98	.17	.35
Self-Regulation	5,7,10	14.8	(3.2)	15.0	23	15.2	(3.3)	15.0	23	.25	.62	.13
Cognition	3,4	6.2	(1.7)	6.2	26	6.3	(1.9)	6.4	24	.16	.69	.12
Self-Social	4,7	14.2	(3.0)	14.1	26	14.8	(2.7)	14.9	24	1.32	.26	.27
• **Social Skills (SSRS)**												
Parent evaluation of social skills	5,6,7	79.8	(13.2)	79.8	26	85.3	(21.9)	85.2	25	1.37	.25	.41
Parent evaluation of problem behaviors	5,6,7	102.3	(13.1)	101.3	27	109.0	(19.0)	110.0	24	5.51	.02	.66
Teacher evaluation of social skills	5,6,7	85.5	(11.7)	86.3	25	87.7	(13.7)	86.9	24	.04	.84	.05
Teacher evaluation of problem behaviors	5,7	106.0	(14.6)	106.2	26	112.5	(14.3)	112.3	24	2.46	.12	.42
Teacher academic comp.	3,6,11	82.1	(10.4)	82.6	26	86.9	(12.4)	86.3	24	1.38	.25	.36
• **Perceived Competence and Social Acceptance**												
Cognitive competence	12,13,14	21.5	(2.4)	21.2	22	20.5	(3.4)	20.9	23	.16	.69	-.13
Physical competence	12,13,14	20.8	(3.3)	20.4	22	19.7	(4.2)	20.2	23	.02	.89	-.06
Social acceptance by peers	12,14,15	18.7	(4.7)	18.3	22	18.5	(3.4)	18.9	23	.35	.56	.13
Social Acceptance by Mother	14,15	18.8	(4.5)	18.4	22	19.1	(4.1)	19.5	23	.82	.37	.24

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[*] 1 BDI Cognitive Raw, 2 = PSI Other Stress, 3 = BDI Total Raw, 4 = Hours per day child in daycare, 5 = PSI Child Stress, 6 = Number of Siblings in Home, 7 = BDI Personal-Social Raw, 8 = BDI Motor Total, 9 = FACES Adaptability, 10 = Mother's Occupation, 11 = PSI Total Stress, 12 = BDI Adaptive Behavior Raw, 13 = FACES Cohesiveness, 14 = Hours worked by Mother, 15 = FILE Total.

[^] Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the SSRS Teacher evaluation of problem behaviors, the numerator for the ES is calculated as less intensive minus more intensive, as lower scores are preferred.

Interestingly, the teacher evaluation of problem behaviors on the SSRS did not indicate significant differences between the groups, whereas the parent evaluation did. The average effect size across all measures was .14. As in the first year, these results suggest some advantage for the group with higher intensity.

Reassessment #4. The significant differences in motor skills observed as Reassessments #1 and #3 appear again at the fourth reassessment. Both the SIB and the Teacher SPECS showed statistically significant differences on motor skills in favor of the more intensive group children. Other statistically significant differences were found for the Teacher SPECS measure of cognition and on the Perceived Competence and Social Acceptance measure for physical competence and social acceptance by mother. The parent evaluation of problem behaviors on the SSRS continued to be negative, although not statistically significant, suggesting that differences on interpersonal social skills that favored the less intensive group have diminished over time. The differences on self-concept were previously unobserved as measured by the Joseph at Reassessments #1 and #2, and by the Harter at Reassessment #3. Self-concept is an area of child functioning which is difficult to measure in early developmental ages of children. Harter (1988) suggests that young children cannot evaluate their self-worth. She suggests that this ability develops as the child's development matures so that, in general, 4- to 7-year-old children can provide reliable information about cognitive competence, physical competence, social acceptance, and behavioral conduct. Different types of disabilities differentially impact the ability of children to evaluate their self-concept for various domains. Also, peer acceptance is one of the areas that those who worked with the program during its conception and implementation believed would be positively affected by the more intensive intervention (see Table 4.16).

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Reassessment #1. Table 4.17 presents the effects of alternate degrees of intensity on measures of family functioning at Reassessment #1 from the PSI. Two variables in this table are worthy of discussion. Parents in the less intensive group perceived higher levels of stress due to factors other than the child, than parents in the more intensive group. It should be noted that families were not differentially involved in their child's intervention. Any differences in family

Table 4.16

Reassessment #4 Measures of Child Functioning for the Jordan Intensity Study

Variable*	Covariates+	Less Intensive				More Intensive				ANCOVA F	p Value	ES^
		$\bar{x}$	(SD)	Adj$\bar{x}$	n	$\bar{x}$	(SD)	Adj$\bar{x}$	n			
• **Woodcock-Johnson Revised Achievement Raw Scores for:**												
Broad Knowledge Total	1	460.0	(22.3)	460.5	28	461.4	(13.6)	460.9	25	.01	.92	.02
Skills Knowledge Total	1,5	422.1	(42.3)	421.6	28	431.4	(31.6)	432.0	25	1.87	.18	.25
• **Scales of Independent Behavior**												
Motor	2,6	454.4	(27.9)	456.4	28	467.0	(12.5)	465.0	25	4.43	.04	.31
Social/Communication	1,8	463.3	(16.1)	463.4	28	460.5	(15.3)	460.4	25	.78	.38	-.19
Personal Living	2	462.9	(23.4)	463.8	28	470.3	(11.5)	469.3	25	1.56	.22	.24
Community Living	1,5	445.8	(22.9)	445.5	28	450.2	(16.2)	450.5	25	1.58	.22	.22
Total	1,8	456.5	(18.7)	456.9	28	461.8	(11.7)	461.5	25	2.17	.15	.25
• **Teacher Developmental SPECS**												
Communication	3	6.5	(1.5)	6.5	26	6.7	(1.0)	6.7	24	.20	.66	.13
Sensorimotor	2,7	15.5	(2.9)	15.6	26	17.0	(2.1)	16.9	24	4.25	.05	.45
Physical	1,8,11	12.6	(1.5)	12.6	26	12.4	(1.8)	12.4	24	.15	.70	-.13
Self-Regulation	3,11,12	14.8	(3.3)	14.9	26	14.7	(3.7)	14.7	24	.12	.73	-.06
Cognition	1,5,11	6.3	(2.2)	5.9	26	6.7	(2.0)	6.8	24	2.83	.10	.41
Self-Social	3,11	14.2	(3.5)	13.9	26	14.5	(3.1)	14.7	24	1.0	.32	.23
• **Social Skills (SSRS)**												
Parent evaluation of social skills	3,9	84.1	(15.5)	84.9	26	83.8	(20.2)	83.0	25	.16	.69	-.12
Parent evaluation of problem behaviors	3,10	104.4	(17.5)	104.0	27	109.9	(18.4)	110.3	24	1.89	,18	-.36
Teacher evaluation of social skills	3,8	88.8	(12.8)	88.8	26	90.0	(14.7)	89.9	24	.12	.73	.09
Teacher evaluation of problem behaviors	3,13	110.3	(15.1)	109.3	26	108.3	(14.3)	109.2	24	.00	.97	.01
Teacher Academic Comp.	1	87.0	(12.9)	87.1	27	87.5	(10.1)	87.4	23	.01	.94	.02
• **Perceived Competence and Social Acceptance**												
Cognitive competence	1,14	19.2	(4.2)	18.9	26	19.3	(3.7)	19.6	25	.43	.52	.17
Physical competence	1,9	17.8	(5.1)	17.3	26	19.8	(4.2)	20.2	25	6.53	.01	.57
Social acceptance by peers	1,15,16	17.3	(4.3)	17.3	26	18.4	(4.2)	18.4	25	.88	.35	.26
Social Acceptance by Mother	15,17	16.3	(4.3)	15.7	26	17.2	(4.2)	17.9	25	3.86	.06	.51

+ 1 = Battelle Total Raw, 2 = BDI Motor Total, 3 = BDI Personal-Social Raw, 4 = BDI Adaptive Behavior, 5 = FACES Adaptability, 6 = Cohesion, 7 = Child's age at pretest, 8 = PSI child-related stress, 9 = PSI other-related stress, 10 - PSI total stress, 11 - Hours per day child in daycare, 12 = FRS external support score, 13 = FRS total score, 14 = Hours mother works per week, 15 = income, 16 = birth order of child, 17 = education of mother.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the SSRS Teacher evaluation of problem behaviors, the numerator for the ES is calculated as less intensive minus more intensive, as lower scores are preferred.

Table 4.17

Reassessment #1 Results of Family Functioning for Jordan Intensity Study

Variable	Covariates+	Less Intensive				More Intensive				ANCOVA F	p Value	ES^
		$\bar{x}$	(SD)	Adj$\bar{x}$	n	$\bar{x}$	(SD)	Adj$\bar{x}$	n			
Parenting Stress Index (PSI)												
Child Related (range 47 to 235)	1,2,7	118.4	(26.4)	116.6	28	112.0	(22.5)	113.8	25	.40	.53	.11
Other Related (range 54 to 270)	3,5	130.5	(17.4)	128.0	28	117.2	(26.1)	119.8	25	4.03	.05	.47
TOTAL (range 101 to 515)	4,7	248.9	(38.7)	245.0	28	229.2	(43.2)	233.1	25	2.52	.12	.31

** Analyses for the PSI are based on raw scores. Lower scores are considered better.

^ Effect Size (ES) is defined here as the difference between the groups (Less Intensive minus More Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size).

+ Covariates: 1 = BDI Adaptive Behavior, 2 = PSI Child Related, 3 = PSI Other Related, 4 = PSI Total, 5 = FRS Total, 6 = FSS Total (mother), 7 = Number of Siblings Living at Home.

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functioning resulting from the intervention program would be indirect, because of changes in child functioning or because of increased time available to parents in the more intensive intervention.

Reassessment #2. Results of Reassessment #2 measures of family functioning are shown in Table 4.18. The results show no statistically significant differences between groups on the PSI.

Table 4.18

Reassessment #2 Measures of Family Functioning for the Jordan Intensity Study

		Less Intensive				More Intensive						
Variables	Covariates+	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES^
Parenting Stress Index** (PSI)												
Child Related (range 47 to 235)	2	110.0	(26.3)	110.7	28	115.8	(23.6)	115.1	25	.67	.42	-.17
Other Related (range 54 to 270)	1,3,5	125.6	(20.3)	120.2	28	122.0	(32.5)	127.3	24	1.7	.2	-.35
TOTAL (range 101 to 505)	4	235.6	(41.6)	233.1	28	237.7	(51.4)	240.2	24	.48	.49	-.17

** Analyses for the PSI is based on raw scores. Lower scores are considered better.

^ Effect Size (ES) is defined here as the difference between the groups (Less Intensive minus More Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size).

+ Covariates: 1 = FACES Cohesion, 2 = PSI Child Related, 3 = PSI Other Related, 4 = PSI Total, 5 = FRS Total

Reassessment #3. Table 4.19 reports the results of analysis of covariance for family functioning at Reassessment #3. The results on the CEFF show statistically significant differences in favor of the more intensive group for the coping and financial scales (note that lower scores are preferred on the CEFF).

Table 4.19

Reassessment #3 Measures of Family Functioning for the Jordan Intensity Study

		Less Intensive				More Intensive						
Variable	Covariates*	$\bar{x}$	(SD)	Adj$\bar{x}$	n	$\bar{x}$	(SD)	Adj$\bar{x}$	n	ANCOVA F	p Value	ES^
Family Functioning (CEFF)												
Time Demands	1,2,3	12.0	(4.8)	12.5	25	13.4	(4.5)	12.9	25	.13	.72	-.08
Acceptance-Problems	2,3,4	.9	(1.4)	1.0	27	1.5	(2.4)	1.5	25	.86	.36	-.36
Coping	3,5	17.0	(4.5)	17.1	27	14.2	(5.1)	14.1	25	5.59	.02	.67
Social Relationship	2,3	12.8	(4.0)	13.0	27	13.3	(5.1)	13.1	24	.02	.88	-.03
Financial	2,3	4.5	(2.9)	4.5	27	3.5	(2.2)	3.5	24	3.05	.09	.35
Well-Being	2,3	14.0	(3.8)	14.0	27	14.3	(3.0)	14.2	25	.06	.81	-.05
Sibling Relationship	3,5	23.9	(8.3)	23.3	27	23.0	(11.3)	23.7	25	.02	.90	-.05
Situational Stress	1,2,3	19.5	(7.9)	20.3	27	18.3	(7.2)	17.5	25	2.49	.12	.35
Total CEFF	1,2,3	84.2	(15.4)	85.8	25	83.1	(21.4)	81.5	25	1.00	.32	.28

* 1 = Hours per day child is in daycare, 2 = BDI Total, 3 = PSI Child Stress, 4 = Number of siblings living in home, 5 = Income

^ Effect Size (ES) is defined here as the difference between the groups (Less Intensive minus More Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size). Lower scores are preferred on the CEFF.

Reassessment #4. The family measures at the fourth reassessment show no statistically significant differences between the groups using an alpha level $\leq .10$. However the PSI, in particular the parent/child dysfunction domain, shows consistently negative ES, suggesting higher stress among more intensive group families (see Table 4.20).

Table 4.20

Reassessment #4 Measures of Family Functioning for the Jordan Intensity Study

Variable	Covariates*	Less Intensive				More Intensive				ANCOVA F	p Value	ES^
		$\bar{x}$	(SD)	Adj$\bar{x}$	n	$\bar{x}$	(SD)	Adj$\bar{x}$	n			
PARENTING STRESS INDEX (SHORT FORM) (PSISH)**												
Parent Distress	1,3,4	25.1	(7.3)	24.5	27	25.5	(8.4)	26.2	25	.98	.33	-.23
Parent/Child Dysfunction	2,4,5	22.8	(5.5)	22.4	27	24.4	(7.3)	24.8	25	2.71	.11	-.44
Difficult Child	2,6	29.4	(10.3)	29.2	27	31.1	(9.4)	31.3	25	.89	.35	-.20
Total Score	2,4,6	77.5	(18.5)	76.7	27	81.2	(23.5)	82.1	25	1.52	.22	-.29

* 1 = PSI other related stress score, 2 = PSI total score, 3 = FRS total score, 4 = income, 5 = # of siblings with disabilities, 6 = Pretest Battelle personal/social score

^ Effect Size (ES) is defined here as the difference between the groups (Less Intensive minus More Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

** Analyses for the PSI is based on raw scores. Lower scores are considered better.

Severity Subanalysis

Many subjects in this study exhibited relatively severe disabilities. Two thirds of the children in the study had pretest BDI DQs of 65 and below. The range of DQs was from 40 to 100. Consequently one of the issues of concern is whether there was a differential impact of the intervention based on the degree of delay exhibited by a child. An analysis was done to examine the interaction of severity with intensity of intervention by dividing the children into mild and severe groups. The medians of BDI raw scores were used as the cutoff for each of the BDI domain and total scores with children below the median recoded as severe and those above the median as mild. A MANOVA for the two intervention groups was conducted for the new BDI pretest severity variables. The severe, more intensive children were statistically significantly more severe on the BDI total score (p = .09). None of the other interactions between severity and group on the BDI pretest scores was statistically significant. A group by severity of disability (2 x 2) analysis of variance was conducted for all of the child measures for the four reassessments. The results of this analysis are presented in Tables 4.21 to 4.24.

The results of this subanalysis for the four reassessments are presented in Tables 4.21 to 4.24. Statistically significant interactions between group and severity appear for many of the adaptive, motor, and cognitive domains. For the motor and adaptive domains, the statistically significant difference derives from the relatively more severe children who were in the more intensive group placement. These children are scoring significantly higher on most of the adaptive and motor measures for the four reassessments.

There is also a statistically significant interaction effect, beginning at Reassessment #2, on the measure of self-concept and on teacher ratings of cognitive development. The less severely delayed children in the 5-day-per-week intervention scored lower on self-concept and cognition than their mild 3-day-per-week counterparts at Reassessments #2 and #3. The more severe children who were in the 5-day-per-week intervention scored higher on cognition and self-concept than their 3-day-per-week counterparts at Reassessments #2 and #3.

Combining these results with the overall group comparisons from Tables 4.13 to 4.16 suggests that the difference by group for motor scores derives from the more severely disabled children.

The reassessment #2 results by group (Table 4.14) showed no statistically significant differences between the more and less intensive intervention group children. The severity interaction analysis sheds some light on why there were no group differences on motor or cognitive scores. For the mild group there are statistically significant differences in favor of the less intensive group on BDI cognitive, total and Joseph self concept scores. The teacher SPECS measure of cognition also shows the less intensive, mild children rated significantly higher. The more intensive severe children scored significantly higher on motor scores and

Table 4.21

Reassessment #1 Severity Subanalysis of Child Outcomes for Jordan Intensity Study

		MILD										SEVERE											
		Less Intensive				More Intensive						Less Intensive				More Intensive							
Variable	Covariates♦	x̄	(SD)	Adj.x̄	n	x̄	(SD)	Adj.x̄	n	ES	p	x̄	(SD)	Adj.x̄	n	x̄	(SD)	Adj.x̄	n	ES	p	F	p
• **Battelle Developmental Inventory (BDI)**																							
Personal Social	1	127.9	(11.2)	128.4	15	133.9	(12.4)	131.3	11	.26	.53	90.1	(25.9)	93.5	13	99.1	(16.1)	97.8	14	.30	.45	.03	.87
Adaptive Behavior		84.4	(9.1)	84.4	14	83.3	(7.7)	83.3	13	-.12	.76	60.4	(8.0)	60.4	14	69.5	(6.2)	69.5	12	1.14	.01	5.59	.02
Motor	2	115.1	(7.7)	114.7	14.	119.3	(9.0)	119.3	13	.60	.13	81.8	(13.5)	81.8	14	92.3	(14.5)	92.3	12	.78	.06	1.54	.22
Communication		63.6	(11.3)	63.6	16	63.5	(9.8)	63.5	13	-.01	.98	42.5	(13.3)	42.5	12	44.6	(8.2)	44.6	12	.16	.70	.14	.71
Cognitive		54.8	(8.1)	54.8	13	56.1	(7.6)	56.1	14	.16	.68	36.2	(7.7)	36.2	15	38.6	(8.3)	38.6	11	.31	.45	.07	.80
Total		442.2	(30.0)		13	441.8	(29.3)		14	-.01	.98	327.3	(54.2)		15	347.5	(38.1)		11	.37	.36	.87	.36
• **Joseph Total**		18.2	(3.2)		13	20.0	(5.6)		13	.56	.16	16.6	(2.8)		15	16.1	(4.3)		11	-.18	.66	1.08	.31
• **Perceptions of Developmental Status by Teacher**																							
General Development		3.5	(0.5)		13	3.4	(0.5)		14	-.20	.61	2.4	(0.8)		15	3.0	(0.6)		11	.75	.07	3.17	.08
Communication		3.6	(0.4)		16	3.6	(0.6)		13	.00	1.00	2.6	(0.7)		12	2.9	(0.5)		12	.43	.30	1.00	.32
Sensorimotor		4.4	(0.3)		14	4.5	(0.3)		13	.33	.40	3.5	(0.5)		14	4.2	(0.4)		12	1.40	.00	7.67	.01
Physical		4.6	(0.4)		14	4.4	(0.4)		13	-.50	.20	3.2	(0.9)		14	4.0	(0.6)		12	.89	.03	6.06	.02
Self-Regulation		3.9	(0.8)		14	4.1	(0.7)		13	.25	.53	3.1	(0.8)		14	3.2	(1.0)		12	.13	.74	.03	.86
Cognition		3.5	(0.6)		13	3.2	(0.8)		14	-.50	.20	2.0	(0.8)		15	2.6	(0.7)		11	.75	.07	4.93	.03
Self-Social		3.7	(0.8)		14	3.9	(0.5)		13	.25	.53	2.7	(0.9)		14	3.1	(0.9)		12	.44	.27	.06	.81
• **Perceptions of Developmental Status by Parent**																							
General Development		4.0	(0.8)		13	3.4	(0.9)		13	-.75	.06	3.2	(0.6)		15	3.1	(0.5)		11	-.17	.68	1.62	.21
Communication	3,4	3.8	(0.7)	3.6	16	3.9	(0.7)	3.9	13	.43	.26	3.3	(0.4)	3.3	12	3.3	(0.5)	3.4	11	.25	.56	.15	.70
Sensorimotor		4.4	(0.5)		14	4.7	(0.4)		13	.60	.13	3.9	(0.4)		14	4.2	(0.3)		11	.75	.07	.07	.80
Physical		4.5	(0.4)		14	4.5	(0.4)		13	.00	1.00	4.2	(0.5)		14	4.2	(0.5)		11	.00	1.00	.03	.85
Self-Regulation		4.2	(0.6)		14	4.2	(0.7)		13	.00	1.00	3.9	(0.5)		14	3.5	(0.7)		11	-.80	.06	.73	.40
Cognition	3,5	4.0	(0.6)	3.9	13	3.7	(0.8)	3.7	13	-.33	.41	3.3	(0.8)	3.3	15	3.3	(0.9)	3.3	11	.00	1.00	.07	.80
Self-Social		4.1	(0.5)		14	4.1	(0.7)		13	.00	1.00	3.7	(0.5)		14	3.3	(0.8)		11	-.80	.06	1.22	.28

♦ 1 - Number of siblings living at home
2 - Income
3 - PSI child-related stress
4 - Mothers years of education
5 - FACES Adaptation

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Table 4.22

Reassessment #2 Severity Subanalysis of Child Outcomes for Jordan Intensity Study

		MILD										SEVERE											
		Less Intensive				More Intensive						Less Intensive				More Intensive							
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ES	p	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ES	p	F	p
• **Battelle Developmental Inventory (BDI)**																							
Personal/Social		148.0	(17.1)		15	145.9	(13.9)		11	-.12	.76	116.1	(30.0)		13	119.2	(22.7)		14	.10	.79	.19	.67
Adaptive Behavior	1	94.8	(10.1)	94.6	13	89.9	(9.1)	89.8	11	-.48	.25	73.3	(13.9)	74.2	13	77.9	(13.8)	77.3	12	.22	.59	1.39	.25
Motor	2	138.7	(11.4)	138.4	14	135.8	(14.4)	135.0	13	-.30	.45	88.5	(13.7)	89.2	14	107.0	(17.3)	107.5	12	1.34	.00	7.78	.01
Communication	3	78.0	(10.2)	76.4	16	71.8	(7.8)	72.6	12	-.37	.34	50.4	(15.1)	50.6	12	54.7	(12.3)	55.3	11	.31	.47	1.79	.19
Cognitive		79.2	(12.2)		13	67.4	(13.2)		14	-.97	.02	45.4	(18.5)		15	46.7	(11.4)		11	.07	.86	2.72	.11
Total		532.9	(41.8)		13	498.1	(49.2)		14	-.83	.04	393.2	(87.7)		15	412.7	(62.0)		11	.22	.59	2.38	.13
• **Joseph Total**	4	28.4	(1.4)	27.8	13	23.1	(4.8)	22.7	13	-3.64	.00	18.6	(4.4)	18.2	10	20.0	(6.0)	21.4	10	.73	.12	12.51	.00
• **Perceptions of Developmental Status by Teacher**																							
Communication	3	7.3	(1.5)	7.1	16	6.5	(1.2)	6.7	11	-.27	.50	5.3	(1.0)	5.3	12	6.1	(1.7)	6.1	10	.80	.07	2.35	.13
Sensorimotor		17.6	(1.7)		14	17.6	(2.6)		12	.00	1.00	14.5	(1.2)		14	16.0	(1.4)		11	1.25	.01	2.41	.13
Physical	5	13.5	(1.2)	13.6	14	13.8	(1.4)	13.7	12	.08	.84	11.4	(2.3)	11.7	14	12.0	(2.6)	11.7	11	.00	1.00	.00	.95
Self-Regulation	3	16.2	(2.7)	15.9	14	15.8	(4.1)	16.0	11	.04	.92	14.1	(3.6)	14.0	14	12.0	(3.3)	12.3	10	-.47	.27	.94	.34
Cognition	3	8.0	(1.6)	7.8	13	6.4	(1.7)	6.5	11	-.81	.06	4.3	(1.6)	4.3	15	5.7	(2.0)	5.9	10	1.00	.02	8.93	.01
Self-Social	4	14.9	(3.0)	14.5	14	15.6	(3.3)	15.2	12	.23	.57	11.3	(3.8)	11.1	14	11.5	(4.0)	12.5	11	.37	.37	.12	.73
• **Perceptions of Developmental Status by Parent**																							
Communication		8.1	(1.5)		16	6.8	(1.3)		12	-.87	.03	6.7	(1.3)		12	6.5	(1.2)		11	-.15	.72	2.32	.14
Sensorimotor		18.9	(1.4)		14	18.5	(1.3)		13	-.29	.46	16.4	(1.8)		14	17.2	(1.2)		11	.44	.29	2.07	.16
Physical	1,6	13.5	(1.1)	13.5	13	14.1	(1.2)	14.0	11	.45	.28	13.0	(1.1)	13.0	13	12.5	(1.1)	12.6	11	-.36	.39	1.97	.17
Self-Regulation	7	17.1	(2.4)	17.1	14	15.6	(3.0)	15.6	13	-.63	.11	15.2	(2.5)	15.5	14	14.5	(2.2)	14.2	11	-.52	.21	.02	.88
Cognition	3,4	8.8	(1.2)	8.5	13	7.6	(1.4)	7.5	12	-.83	.05	6.9	(1.3)	6.8	15	6.2	(1.9)	6.6	10	-.15	.72	1.04	.31
Self-Social	8	17.5	(2.1)	17.3	13	16.2	(3.0)	16.4	11	-.62	.14	14.9	(1.5)	15.1	14	14.0	(3.2)	13.7	9	-.93	.04	.11	.74

♦ 1 = Highest degree completed by father
2 = Adults in home attending school
3 = Occupation of father
4 = Hours in daycare
5 = Number of siblings living at home
6 = Income
7 = FRS Total
8 = Hours worked by father

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Table 4.23

Reassessment #3 Severity Subanalysis of Child Outcomes for Jordan Intensity Study

		MILD										SEVERE											
		Less Intensive				More Intensive						Less Intensive				More Intensive							
Variable	Covariates◆	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ES	p	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ES	p	F	p
• **Woodcock Johnson Revised Achievement Raw Scores**																							
Broad Knowledge	1	465.2	(12.6)	464.0	13	459.3	(10.1)	459.6	14	-.35	.36	440.9	(24.3)	440.9	15	441.3	(16.2)	442.2	11	.05	.90	.40	.53
Skills Knowledge	1	429.8	(19.8)	428.2	13	423.9	(23.9)	424.3	14	-.20	.61	374.9	(46.7)	374.8	15	395.3	(28.1)	396.5	11	.46	.26	2.10	.15
• **Scales of Independent Behavior**																							
Motor	2	467.2	(16.1)	465.5	14	470.3	(16.0)	467.2	13	.11	.77	429.6	(27.6)	428.7	14	446.7	(22.3)	452.5	12	.86	.04	2.75	.10
Social/Communication	3,4	464.0	(10.8)	462.8	16	460.5	(11.4)	459.9	13	-.27	.48	440.7	(23.4)	443.3	12	454.4	(12.2)	453.6	12	.44	.29	2.56	.12
Personal Living	2	472.3	(11.3)	470.8	14	471.0	(10.6)	469.5	13	-.12	.76	448.9	(11.3)	448.3	14	461.5	(12.3)	465.1	12	1.49	.00	8.16	.01
Community Living	2	448.6	(19.2)	446.6	14	447.2	(21.3)	445.2	13	-.07	.85	428.3	(24.3)	427.5	14	438.8	(11.3)	443.5	12	.66	.10	2.37	.13
Total	2,4	465.0	(9.5)	463.3	13	461.6	(11.8)	460.4	14	-.31	.43	437.9	(15.3)	436.9	15	450.1	(12.2)	454.1	11	1.12	.01	8.60	.01
• **Perceived Competence and Social Acceptance**																							
Cognitive Com.	5,6	21.9	(2.5)	21.4	12	20.7	(3.5)	20.6	13	-.32	.44	21.1	(2.3)	20.9	10	20.3	(3.5)	21.1	10	.09	.84	.29	.59
Physical Comp.	5,6	22.1	(1.8)	21.6	12	19.2	(4.5)	19.2	13	-1.33	.00	19.3	(4.0)	18.7	10	20.4	(3.8)	21.5	10	.70	.13	5.85	.02
Social Acceptance by Peers	6,7	19.6	(4.8)	19.5	12	19.0	(3.9)	19.0	13	-.10	.80	17.6	(4.6)	16.8	10	17.9	(2.8)	18.8	10	.43	.35	1.08	.31
Social Acceptance by Mother	6.7	19.4	(5.0)	19.3	12	19.5	(4.6)	19.4	13	.02	.96	18.0	(3.9)	17.2	10	18.6	(3.3)	19.6	10	.62	.18	.80	.38
• **Teacher Developmental SPECS**																							
Communication	4	6.6	(1.8)	6.3	14	6.8	(1.1)	6.8	13	.28	.48	6.3	(1.1)	6.5	12	9.5	(9.4)*	9.6	10	2.82	.00	1.10	.30
Sensorimotor		16.8	(1.9)		12	18.2	(1.6)		13	.74	.07	14.3	(1.7)		14	16.1	(2.1)		10	1.06	.02	.15	.70
Physical	2,8	13.5	(1.6)	13.2	12	13.2	(1.4)	12.9	13	-.19	.64	11.4	(1.9)	11.2	14	12.1	(2.3)	12.9	10	.89	.04	2.96	.09
Self-Regulation	4,9	15.4	(3.9)	15.3	13	15.4	(3.6)	15.6	12	.08	.84	13.7	(2.2)	14.1	13	15.2	(3.2)	14.7	10	.27	.53	.03	.86
Cognition	2	7.4	(1.2)	7.2	11	6.4	(2.0)	6.4	14	-.67	.11	5.3	(1.4)	5.2	15	6.2	(1.8)	6.5	9	.93	.04	4.98	.03
Self-Social	2	15.7	(3.0)	15.7	13	15.9	(1.8)	15.9	12	.07	.86	12.6	(2.1)	12.6	13	13.5	(3.1)	13.6	11	.48	.25	.25	.62
• **Parent Developmental SPECS**																							
Communication	2,4	7.6	(1.4)	7.4	16	7.4	(1.1)	7.3	13	-.07	.85	7.4	(1.0)	7.3	12	7.1	(1.3)	7.4	11	.10	.81	.04	.84
Sensorimotor	2	18.6	(1.5)	18.6	14	18.5	(1.4)	18.4	13	-.13	.74	16.1	(2.0)	16.0	14	16.9	(1.6)	17.1	11	.55	.18	1.38	.25
Physical	3,4	13.6	(1.5)	13.7	14	13.5	(1.5)	13.5	13	-.13	.74	12.1	(1.5)	12.3	14	12.7	(1.3)	12.5	11	.13	.75	.30	.59
Self-Regulation	2,4	17.2	(2.2)	16.3	14	15.7	(3.9)	15.5	13	-.36	.36	14.8	(2.4)	15.3	14	14.8	(3.3)	15.4	11	.04	.92	.42	.52
Cognition	2,4	8.2	(1.1)	7.9	13	8.2	(1.4)	8.2	14	.27	.50	6.7	(1.7)	6.6	15	6.9	(1.7)	7.2	10	.35	.40	.19	.67
Self-Social	2,4	17.4	(2.3)	16.6	14	15.8	(3.5)	15.5	13	-.48	.22	14.4	(2.4)	14.7	14	14.7	(2.8)	15.2)	11	.21	.61	1.65	.21

◆ 1 - PSI other stress
2 - Hours in daycare
3 - Number of siblings living at home
4 - PSI child-related stress
5 - FACES cohesion
6 - Hours worked by mother
7 - FILE Total
8 - FACES Adaptation
9 - Occupation of mother

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Table 4.24

Reassessment #4 Severity Subanalysis of Child Outcomes for Jordan Intensity Study

		MILD										SEVERE											
		Less Intensive				More Intensive						Less Intensive				More Intensive							
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ES	p	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ES	p	F	p
• **Woodcock-Johnson Revised Achievement Raw Scores**																							
Broad Knowledge		472.4	(11.0)		13	467.4	(9.5)		14	-.45	.25	449.3	(24.4)		15	453.7	(14.4)		11	.18	.66	1.08	.31
Skills Knowledge	1	448.9	(20.5)	444.8	13	444.5	(24.6)	446.4	14	.08	.83	398.9	(42.9)	398.9	15	414.7	(32.6)	414.7	11	.37	.36	1.13	.29
• **Scales of Independent Behavior**																							
Motor	2	473.2	(12.2)	473.1	14	473.8	(10.0)	473.6	13	.04	.92	435.5	(26.4)	436.4	14	459.7	(11.0)	459.0	12	.86	.04	5.41	.02
Social/Communication	3	471.3	(13.1)	469.7	16	464.5	(16.1)	464.4	13	-.40	.29	452.6	(13.5)	453.9	12	456.3	(13.8)	456.5	12	.19	.65	1.11	.30
Personal Living		473.6	(18.6)		14	471.2	(10.5)		13	-.13	.74	452.1	(23.2)		14	469.4	(12.8)		12	.75	.07	4.24	.05
Community Living	1	455.2	(17.9)	453.0	14	452.9	(17.0)	453.3	13	.02	.96	436.4	(24.0)	435.9	14	447.3	(15.4)	449.7	12	.58	.15	1.79	.19
Total	3	471.2	(9.3)	470.7	13	465.4	(10.9)	465.1	14	-.60	.13	443.8	(15.1)	444.1	15	457.3	(11.5)	457.8	11	.91	.03	8.42	.01
• **Perceived Competence and Social Acceptance**																							
Cognitive Comprehension	4	20.7	(3.0)	20.5	13	20.3	(3.4)	20.2	14	-.10	.79	17.7	(4.8)	17.5	13	18.1	(3.9)	18.6	11	.23	.59	.43	.51
Physical Comprehension	5,6	20.5	(3.4)	19.6	13	20.6	(3.9)	20.5	14	.26	.51	15.1	(5.2)	15.2	13	18.7	(4.6)	19.6	11	.85	.05	2.59	.11
Social Acceptance (Peers)	7	18.9	(4.9)	19.2	13	19.5	(3.5)	19.4	14	.04	.92	15.6	(2.8)	15.6	13	17.1	(4.6)	17.1	11	.54	.20	.20	.65
Social Acceptance (Mother)	5,8	17.7	(4.5)	16.4	13	17.6	(3.7)	17.7	14	.29	.46	15.0	(3.9)	14.9	13	16.6	(4.9)	17.9	11	.77	.07	.61	.44
• **Teacher Developmental SPECS**																							
Communication		6.8	(1.6)		15	7.0	(1.0)		12	.13	.74	6.1	(1.4)		11	6.3	(1.0)		12	.14	.74	.00	.96
Sensorimotor	9	16.7	(2.8)	16.6	13	18.2	(1.5)	18.1	12	.54	.19	14.4	(2.5)	14.5	13	15.9	(2.0)	16.0	12	.60	.14	.00	.98
Physical	3,10	12.8	(1.5)	12.8	13	12.9	(1.8)	12.8	12	.00	1.00	12.4	(1.6)	12.4	13	11.8	(1.6)	12.0	12	-.25	.55	.18	.68
Self Regulation	10,11	15.7	(3.4)	15.4	12	15.9	(4.0)	15.6	12	.06	.88	14.1	(3.1)	14.2	14	13.4	(2.9)	13.9	12	-.10	.80	.06	.81
Cognition	1,10	7.4	(1.7)	7.1	13	7.3	(1.9)	7.3	13	.12	.76	4.7	(1.8)	4.6	13	6.0	(2.0)	6.4	11	1.00	.02	2.28	.14
Self-Social	10	15.7	(3.4)	15.4	12	15.6	(3.8)	15.3	12	-.03	.94	12.9	(3.1)	12.7	14	13.4	(2.0)	14.2	12	.48	.23	.72	.40

♦ 1 - FACES Adaptation
2 - Cohesion
3 - PSI child-related stress
4 - Adults in home attending school
5 - Income
6 - Birth order of child
7 - PSI other stress
8 - Mother's years of education
9 - child's age at pretest
10 - Hours in daycare
11 - FRS External Support

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the Joseph approaches significance and has an ES of .73. The more intensive group children are not scoring consistently better on child outcomes and this evidence suggests that there may be differential benefits for different domains from intensive early intervention dependent on the severity of the child's disability.

The differences between the groups continued to fade so that by reassessment #4 there were no statistically significant differences between the more and less intensive children with mild delays. The differences favoring the more intensive intervention for severely delayed children were more durable. Statistically significant differences were observed on motor, personal living and total SIB scores and for physical competence and social acceptance by mother. Also the Teacher SPECS suggests higher cognitive functioning for the more intensive early intervention children with severe delays.

Educational Placement

Table 4.25 shows the early intervention service difference for the 1988-89 school year. The table also outlines educational placement for the children in the two groups at Reassessments #2, #3, and #4. Most of the children remain in the Jordan School District service area.

Table 4.25

Early Intervention and Education Services by Group

	Less Intensive			More Intensive		
	3 days per week	5 days per week		3 days per week	5 days per week	
1988-89	28	0		0	25	
	Preschool Intervention	School Intervention	No Educational Services	Preschool Intervention	School Intervention	No Educational Services
1989-90	9	19	0	9	15	1
1990-91	0	27	1	0	25	0
1991-92	0	28	0	0	25	0

After all of the children were old enough to be enrolled in public school programs (5 years or older), educational placement data were gathered from teachers at Reassessments #3 and #4. The results are presented in Table 4.26. No statistically significant differences between the groups are indicated on classroom placement or the other educational service variables which include grade retention and eligibility for special education services.

Table 4.26

Educational Placement of Jordan Intensity Subjects (as reported by the child's teacher)

	Less Intensive		More Intensive			
	$\bar{x}$	n	$\bar{x}$	n	p Value	ES^
REASSESSMENT #3						
Child retained in grade	12%	26	13%	24	.92	-.03
Eligible for special education	96%	26	88%	24	.28	.40
REASSESSMENT #4						
Child retained in grade	8%	26	8%	24	.92	-.03
Eligible for special education	100%	26	96%	24	.53	.18

^ Effect Size (ES) is defined here as the difference between the groups (low intensity minus high intensity) on the $\bar{x}$ scores divided by the standard deviation of the Less Intensive Intervention Group (Lower scores are preferred on all 3 placement variables) (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

Another issue related to educational placement of subjects in the study is whether educational service cost differences exist. While the differences in educational placement are not statistically significant, there are differences in service. How do these differences translate into dollar cost to the school system, and ultimately to taxpayers? As shown in Table 4.27, more children from the more intensive early intervention program received regular education services for most of the day while fewer of the less intensive subjects were in self-contained placement for a full day at reassessment #3. The cost of special education services is estimated at more than double that of non-special education placement, and the more time spent in self-contained placement the higher the cost, all other things equal (Kakalik et al., 1981; Moore & Steele, 1988).

Table 4.27

Reassessments #3 and #4 Educational Placement

	Less Intensive		More Intensive	
	# of Subjects	% of Subjects	# of Subjects	% of Subjects
REASSESSMENT #3				
Full-Day Regular Education	1	3.8	3	12.5
Resource Room	9	34.6	5	20.8
50% Self-Contained, 50% Regular Education	4	15.4	2	8.3
100% Self-Contained	12	46.2	14	58.4
TOTAL	26	100.0	24	100.0
REASSESSMENT #4				
Full-Day Regular Education	0	0	1	4
Regular education w/therapy	5	19	5	20
Regular education w/resource	1	4	1	4
Regular education w/resource & therapy	5	19	1	4
Self-Contained < three hours	2	8	0	0
Self-contained ≥ three hours	13	50	16	64
Home School	0	0	1	4
TOTAL	26	100	25	100

A study of the costs associated with the various educational placements illustrated in Table 4.27 begins in October 1992. This study will determine whether there are any measurable differences in costs of current educational services for children in the study. Differences in cost between the groups will be measured to determine whether there are financial benefits to school districts that result from different early intervention investments. For the present study, the 5-day, more intensive services cost approximately $2,400 more than the 3-day intervention program. Whether or not benefits, in the form of later school cost differences, are greater or less than the $2,400 investment will provide information on the benefit cost ratio for this type of early intervention comparison study.

Summary and Conclusions

This study examined whether a "more intensive" center-based early intervention program compared to a "less intensive" program would result in demonstrable benefits for participating children and their families. Intensity was operationalized according to several different variables. The more intensive program provided services to children 10 hours per week (versus 6 hours per week for the less intensive program); the more intensive program had a 3 to 1 child:teacher ratio (whereas, the less intensive program had a 5 to 1 child:teacher ratio); and 5 times as much language therapy was available to children in the more intensive group as compared to the less intensive group. Other than these variables, the two intervention programs were organized similarly (e.g., curricula used, teaching styles, organizational structure, etc.) Indeed, the same teachers taught some children in each group so that quality or style of teaching would not be a confounding factor.

Obviously, intensity can be defined in a variety of different ways (e.g., duration of intervention, hours per week of intervention, percent engaged learning time, amount of one-on-one versus group interaction, etc.) However, based on previous research, it was clear that the variables selected to define "intensity" in this study were among those most frequently thought of as contributing to "more intense" interventions. Furthermore, the treatment verification data collected as a part of this study, demonstrated that children in the more intensive group did indeed receive more hours of intervention per week, were "engaged in learning" a similar percentage of time they attended (resulting in more total hours per week of engaged learning time), participated in a higher percentage of individualized and small group activities, had lower child:teacher ratios, and received more one-on-one language therapy.

The hypothesis on which the study was based was that children participating in the more intensive intervention would show greater developmental gains, and their families would benefit in terms of reduced stress and enhanced family functioning. This hypothesis was based on the conclusions of previous reviewers of the early intervention literature that more intensive early intervention programs were more beneficial, as well as the widespread perceptions of practitioners, administrators, and policymakers that more intensive early intervention programs will not only be beneficial for participating children and families but will result in long-term cost savings. The position is a logical one based on what we know about prevention in many different areas. Unfortunately, there is very little data from methodologically sound studies to confirm or refute the hypothesis that more intensive early intervention programs will be more beneficial. Consequently, this study was designed to ensure that the definition of intensity used was relevant to the types of programming options available to administrators, that the study was methodologically well-designed, and that information was collected to document that the interventions were implemented as intended (i.e., one substantially more intensive than the other.)

The results after four years are surprising. There is evidence that the more intensive program resulted in benefits in some areas for participating children. For the comparison of child functioning by intensity of early intervention, twenty-one of 93 measures of child progress were statistically significant ($\alpha \leq .10$), with 16 of those favoring the more intensive group and 5 favoring the less intensive group. The area most frequently showing benefits for the more intensive group was motor development, and the area most frequently showing benefits for the less intensive group was the measures of appropriate behavior.

For the family measures, there is less evidence of benefits associated with the more intensive program. This is not surprising, since it was only expected that there would be indirect effects on family functioning. Ten of the 23 measures favored the more intensive group, while 13 of the 23 favored the less intensive group.

The subanalysis of severity by intensity of intervention sheds more light on the effects of the intervention for children with moderate and severe disabilities. All of the differences for the severe children are positive and suggest that the five day per week program benefited the severe children for a variety of areas of child functioning. The most consistent evidence is for motor skills which favor the more intensive intervention children whether measured by the SIB, or Parent or Teacher SPECS. There is also some evidence that the more severe children scored higher on the adaptive domain of the BDI and teacher SPECS cognitive and communication scores and on personal and community living skills on the SIB. They also had higher perceptions of acceptance by mother and physical competence.

The children with relatively mild impairments who were in the less intensive early intervention program scored higher on some cognitive and self concept measures than their more intensive intervention counterparts. There were very few areas, such as an isolated Teacher SPECS rating on motor skills, where the mildly impaired, more intensive group children scored higher than those in the less intensive group intervention.

The fact that the more intensive program cost about $2,500 more per child per year (approximately 75% more) than the less intensive program for moderate and fluctuating gains raises additional questions. It is often suggested that the initial investment in early intervention will more than be repaid in later years because fewer special education services will be needed. Given the data from the earliest years of these children's educational experience, such cost savings are not yet documented. A more detailed benefit-cost analysis of the effects of the more-intensive intervention is currently underway. It will provide more reliable data to address this important issue.

In interpreting the results of this study, several points are important to keep in mind. First, this study was particularly well-done from a methodological perspective. Children were randomly assigned to groups; there was extensive documentation regarding the comparability of those groups prior to the implementation of the treatment; diagnosticians for most measures were uninformed about the purposes of the research or the group membership of children; there was extensive verification that the treatment was implemented as planned, contextual variables that might have contaminated the experimental design or affected the results were documented, and a broad set of child and family functioning measures were collected.

At the same time, the results from this study should not be accepted unconditionally or prematurely to make policy decisions. Instead, the results of this study need to be replicated before they are accepted as something more than sampling fluctuation. Such replications need to be done by independent investigators using similarly rigorous techniques.

Second, even though it is important to note that the alternative levels of intensity in this study are substantially different, perhaps they were not different enough. The one study in the literature with children with disabilities, which found substantial differences attributable to different levels of intensity, was done by Lovass with a group of autistic children. In that study, the more intensive program consisted of 40 hours per week of one-to-one programming. In this study, the more intensive program consisted of 10 hours per week of primarily group programming. Thus, it is possible that a certain "threshold" of intensity must be achieved before benefits become apparent. However, it should be remembered that the levels of intensity investigated in this study are typical of the "upper-end" of intensities currently available to most program administrators given current resources. Thus, even though it is important to determine whether even higher levels of intensity would result in greater benefits, the feasibility of implementing those higher levels must be considered as research is designed.

Third, it is clear that the way in which intensity was defined in this study accounted for only a few of the many different variables which are included in the general construct of "intensity." Perhaps other ways of "intensifying" programs would have lead to different results. Those questions must still be addressed and the results of this study should not be interpreted to suggest that the entire construct of intensity has been evaluated. Still, the variables of hours of engaged learning time per week, child:teacher ratios, and availability of one-on-one related services are among the most frequently noted dimensions when people discuss the construct of intensity.

Fourth, it is apparent that "sleeper effects" are possible, as shown by the Harter results at Reassessment #4. This study documents the importance of longitudinal research to more fully capture and explain observed differences in family and child functioning. The absence of child differences at Reassessment #2, especially on motor skills, makes apparent the importance of following the sample over long periods of time. The motor results are, after four reassessments, much more convincing than if the study had ended after the second assessment. Future data, especially measures such as the Perceived Competence and Social Acceptance that assesses self concept, are critical if these results are to be more clearly understood. The duration of these differences is important in assessing the efficacy of the intervention and can only be captured with longitudinal evaluation. Qualitative research may also lead us to different perspectives about the impact of early intervention on individual families and children.

As noted in the previous points, there are a number of good reasons why we should be cautious in concluding from these results that there will be little or no benefits for children and families if substantially more intensive early intervention programs are offered. As one study, this information makes an important contribution to our knowledge concerning the effects of more intensive early intervention programs, but it is only one study. The evidence on dollar benefits from different intensities of early intervention services is not yet available for this population. More research is needed before we will adequately understand the relationship between intensity of intervention and progress made by participating children and families. The worst use of these results would be a simple-minded knee-jerk reaction which concludes that more intensive programs are not beneficial. Instead, these results strongly suggest the need for replication, and systematic extensions in which different types of intensity are tested and the "threshold" hypothesis is more closely examined.

Each year the federal government spends billions of dollars on early intervention programs for children who are disabled, disadvantaged or at-risk. State and local governments spend additional money equal to several times that amount. The results of this study suggest that we should be cautious about concluding that more is necessarily better. More importantly, however, these results emphasize the need to immediately begin devoting substantial resources to conducting additional well-designed longitudinal research studies to determine what type of intervention programs are best for which children and their families. Because there will always be a finite amount of resources to fund early intervention, it is particularly important to evaluate the effects of those variables most closely related to costs. Intensity is one such issue. The results of this study add substantially to our knowledge about the effects of varying intensity, but much more research is needed.

SALT LAKE MEDICALLY FRAGILE AGE-AT-START STUDY

Project #5

COMPARISON: Grades I, II, III, and IV Intraventricular Hemorrhage Infants (IVH) --Services begun at 3 months adjusted age vs. services begun at 18 months adjusted age.

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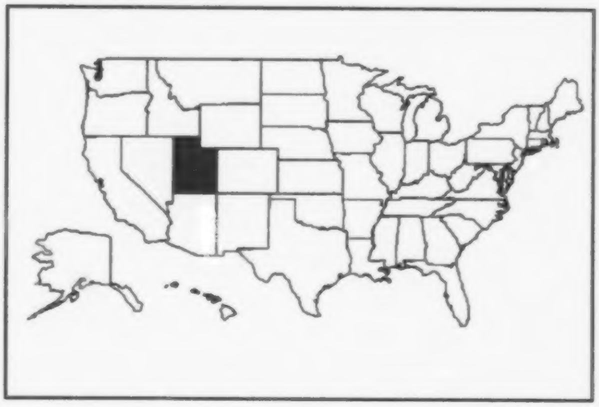
LOCATION: Salt Lake City, Utah

DATE OF REPORT: 10-1-1992

Rationale for the Study



Early intervention specialists generally accept the premise that the earlier interventions are initiated with children who have, or are at risk for developing, disabilities, the greater will be the positive effects of those interventions. The basis for this premise is developmental theory, which indicates that early experience has a profound impact upon the development of young children. Early experience is seen as being even more critical for children with disabilities or who are preterm. These children are often less responsive and provide fewer readable cues (Rogers, 1988), and thus may interact differently with the environment and have fewer of the early experiences that promote optimal development.

Providing interventions as early as possible has been supported by other rationales. More time is available to impact deficits. There appears to be greater plasticity of the neural system when the infant is very young (Anastasiow, 1990). The social movement of the 1960s with the initiation of Head Start programs provided a model for delivering intervention early.

That this premise is well accepted by the early intervention community is evidenced by the fact that White, Bush, and Casto (1985-86) found it to be the second most frequently cited variable concomitant with early intervention effectiveness. Eighteen of the 24 reviewers discussing the age-at-start issue concluded that "earlier is better". Even the federal government, with the passage of Part H of P.L. 99-457, supported the concept that earlier is better.

In spite of this acceptance, Casto and Mastropieri (1986), through a meta-analysis of 74 studies of early intervention with children with disabilities from birth to five years of age, concluded that there was little evidence to support the premise that intervention given at younger ages resulted in greater benefits in child development than was intervention given at older ages. Thus far, the empirical evidence in support of earlier age-at-start intervention is truly limited (Mastropieri, 1987), and the results have been confounded in studies with other variables (e.g.,intensity and duration of intervention). Direct comparison designs that isolate the effects of early vs later initiation of intervention with children with disabilities have not been located in the literature. Thus, while the age-at-start question is critically important to the developmental outcome of young children, it remains largely unresolved.

Medically fragile infants have much to gain from the resolution of this age-at-start question. The population of medically fragile infants, who are usually characterized by inappropriately early gestational age, low or very low birthweight, and neonatal complications such as intraventricular hemorrhage or bronchopulmonary dysplasia, are at great risk for serious developmental delays and disabilities. The number of these infants who survive the neonatal period has continually increased due to the advances in medicine (Bennett, 1987; U.S. Congress, 1987). The environment in the neonatal intensive care units, in which many live for as much as three months, is atypical of the early experiences most infants have (e.g., Rosenfield, 1980). These reasons make the investigation of the age-at-start question for the medically fragile population especially urgent. Therefore, this study compared the effects of intervention initiated "early" with the effects of intervention initiated "later" in the lives of medically fragile infants who had experienced intraventricular hemorrhage.

Review of Related Research

The present study is unique because it deals with two critical issues in early intervention. The first of these is often referred to as the age-at-start question. The second deals with the specific group of children used: medically fragile infants. Both of these aspects of study will be reviewed in the following paragraphs.

Age-at-start of Intervention

A number of prominent rationales have led the field of early intervention to endorse the premise that the earlier intervention is delivered the more effective it will be (Guralnick, 1991). This premise in founded on theories of child development, which assert that early experience, regardless of intervening experience, has lasting consequences for the child. For example, attachment theorists (e.g., Ainsworth, 1973; Sroufe, 1979) subscribe to the belief that vulnerabilities due to early experience result in later detrimental effects. Other theorists see intelligence as being modifiable, depending on the perceptual and motor experiences one has (Hunt, 1961). In fact, the early years are widely considered critical (a sensitive period) for the development of the central nervous system and of intellectual functioning in general (Bloom, 1964). During this time there appears to be great plasticity of the nervous system, and a lack of certain experiences are seen as a possible cause of later adverse consequences (Anastasiow, 1990).

The logic behind early intervention research has been that if the first years of life are a significant period of development for typical children, then this period is even more critical for impacting the development of children who have disabilities or who are at risk for developing them. In fact, the age for initiating intervention has been found by White, Bush, and Casto (1985-86) in their review of previous reviews of early intervention research to be the second most frequently cited concomitant variable associated with intervention effectiveness. Additionally, 18 of the 24 reviews that drew conclusions about the importance of the age-at-start asserted that "earlier is better". The federal government has also supported the premise that "earlier is better" with the passage of the Part H of P. L. 99-457. This legislation encouraged the development of intervention for children under age three who were "at risk" for developing disabilities.

Through a meta-analysis of 74 studies, Casto and Mastropieri (1986) attempted to compare the effects of intervention initiated at different ages, which they grouped as follows: 0-6 months, 6-18 months, 18-36 months, 36-48 months and 48-66 months. The results of their study did not reveal any advantage for those children who had received intervention at younger ages, and they concluded that there is little empirical evidence supporting the assumption that intervention delivered earlier results in greater gains. As could be expected, all have not agreed with Casto and Mastropieri's findings. Other reviewers have found some benefits from initiating intervention earlier (Shonkoff & Hauser-Cram, 1987; Lovaas, 1987).

The age-at-start issue is complex. Few, if any, studies have isolated the age-at-start issue from confounds and empirically compared the results of intervention initiated at two different ages (Mastropieri, 1987). The intensity and the duration of intervention are other concomitant variables that must be considered in any study investigating the age-at-start issue. Examining the importance of the age for beginning intervention through regression analysis, Mastropieri found that, with a sample of preschoolers with disabilities, pretest Bayley scores alone explained a significant proportion of the variance in development, but that starting age and length of treatment did not. Thus, while the age-at-start question is critical for the implementation of effective intervention, it remains basically unresolved.

As part of the confusion surrounding the age-at-start issue, the best age for intervention (indicating the correct sensitive period) may vary with disability type (Guralnick, 1991). For example, Lovaas (1987) contends that age of start is a critical factor for children with autism. No research investigating the age-at-start issue with other disabilities has been found. Thus, the research conducted in this study directly responds to the age-at-start dilemma, while using a population that stands to benefit greatly from the results: infants born at-risk for later developmental delays.

Medically Fragile Infants

Medically fragile infants (i.e., those with neonatal complications such as bronchopulmonary dysplasia, respiratory distress syndrome, and vision and hearing problems, as well as those with inappropriately early gestational ages and low birthweights) comprise a population for which the "age-at-start" issue is critical. These infants have atypical early experiences (i.e., premature birth and extended treatment in intensive care units), and they often develop serious disabilities (U.S. Congress, 1987; Bennett, 1987). Particularly vulnerable to later life problems are infants who experience intraventricular hemorrhage.

Intraventricular Hemorrhage (IVH). IVH is a condition in which blood seeps into the cerebral ventricles within the brain that secrete and convey cerebrospinal fluid. The hemorrhaging usually occurs within the first or second day after birth. The hemorrhages are graded from mild (I) to severe (IV). Most mild hemorrhages have no lasting effects (U.S. Congress, 1987). Approximately 40% of low birthweight infants (LBW) experience IVH (Bowerman, Donne, Silverman, & Joffe, 1984). IVH is one of the two most frequent causes of neonatal death (U. S. Congress, 1987). An estimated 50-60% of infants who suffer IVH survive (Volpe, 1981); however, information on the future developmental progress in this population is limited and controversial (Hynd et al., 1984). Sostek et al. (1987) found that although level of Grade I or II vs. Grade III or IV, IVH was not related to Bayley mental and motor scores at two years of age as a group, 40% of the children suffering IVH showed severe delays. At older ages, the findings are somewhat equivocal. For example, Williamson et al. (1982) found that 29% of IVH Grade I and II LBW infants exhibited moderate disabilities by the age of 3; whereas Papile et al. (1983) found that only 15% of such children could be diagnosed as having these disabilities. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe disabilities by the third year of life. Bozynski et al. (1984) suggested that neonatal IVH typically resulted in motor rather than mental impairment, particularly in survivors of Grade IV hemorrhage.

Intervention Age-at-Start for Medically Fragile Infants

Recent early intervention literature has described various ages at which interventions with low birthweight infants began and has reported conflicting results. Reviews of this literature (Bennett, 1987; Casto et al., 1987; Ramey, 1984; Sandall, 1990) have continuously concluded that various types of interventions seem to have been effective. However, most of the studies included in the reviews excluded children with neurological conditions such as IVH, and none addressed the issue of the age at which interventions should start. Resnick et al. (1988) did include infants with IVH and other complications and reported that a combination of in-hospital multi-modal intervention and home-based developmental intervention during the first 12 months of life resulted in significant gains in child mental development and in the quality of parent-child interactions.

More recently, the Infant Health and Development program (1990), a multi-site, randomized study, compared the effects of an intensive, educationally-focused, early intervention program for at-risk infants which included a family support and a pediatric follow-up component to a pediatric follow-up only program. Results of this study indicated that children who received the intensive early intervention performed the same as control group children during Years 1 and 2, but they performed better on the Stanford-Binet Intelligence Scale and had fewer behavior problems at 36-months corrected age than did children who received pediatric follow-up alone. However, in infants with birthweights below 1,500 grams and IQ scores lower than 70, there were no treatment effects. In sum, the recent research findings regarding interventions begun early in life are still equivocal and support the need for further studies.

Based on this lack of conclusive data, it was deemed important to determine if interventions beginning early in life could prevent the development of later disabilities in medially fragile infants. Previous to this study, IVH infants in Utah received only medical follow-up. This situation provided an opportunity to test an early versus later intervention hypothesis with two groups of IVH survivors.

Overview of Study

The purpose of this study was to investigate longitudinally the age-at-start intervention question with a sample of medically fragile infants all of whom experienced neonatal intraventricular hemorrhaging. To investigate whether intervention initiated "earlier" is better than intervention initiated "later," the infants were randomly assigned to either of two groups: one in which intervention was initiated when the infants were three months of age (i.e., corrected chronological age [CCA]),[1] and the other in which intervention was initiated when the infants were 18 months of age (CCA). These groups will be called the early intervention group and the delayed intervention group hereafter. The early intervention group began receiving individualized sensorimotor intervention at three months CCA during which time the control group received no such intervention. The number of intervention sessions was determined individually with a minimum of one visit per month. During the pre-18 month period, both the early and delayed intervention groups had access to the standard medical treatment in the treatment area. This included neonatal care at the respective hospitals and referral to the Utah State Department of Health Neonatal Follow-Up Clinic or follow-up from private physicians. Funding for the NICU follow-up services was provided by the Utah State Department of Health, but those parents who accessed service from private physicians paid for the services themselves. Both groups were also free to access other services in the community, if they desired. At 18 months (CCA) of age, both the early and delayed intervention groups began receiving individualized home-based intervention based on the Curriculum and Monitoring System (CAMS) (Casto, 1992). The intervention was given by the project early intervention educator. Sensory motor intervention was also provided to the children, if needed, by a physical therapist. Parents continued to be free to access other services.

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[1] *In other words, a child who is born 4 weeks prematurely would not reach a corrected age of 12 weeks until 16 weeks after birth.*

Schedule of assessments was determined by age of child; initial assessments were performed at the age of 3 months (CCA). Some additional measures were completed at 6 and 12 months of age (CCA). Annual reassessments began at 18 months of age (CCA)[2] and continued until the present when some children are now receiving their 90-month-of-age reassessment. The measures used to identify possible effects from the alternate intervention treatments included multiple measures of child development, family support, family stress, and family functioning. Both the child and the parent (usually, but not always the mother) participated in each reassessment.

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[2] *Use of the chronologically adjusted age was discontinued with the 42-month assessment. At this time, the assessment was timed according to the child's actual age, based on the date of birth.*

Methods

This section presents the procedures for subject recruitment and assignment, the demographic characteristics of the groups, a description of the alternative intervention programs, a discussion of the treatment verification procedures, and cost analysis.

Subjects

A total of 58 subjects were enrolled. All of these subjects had experienced neonatal intraventricular hemorrhages, and all but one had low birthweight. Two subjects have since then died, but both participated in two or more reassessments. Initially, four other parents expressed interest in the study. One of these infants died before any assessments were completed, and one died soon after the initial assessments were completed; two withdrew from the study before the first reassessment.

Recruitment. Infants qualified for participation in the study if they were patients in a Neonatal Intensive Care Unit (NICU) at either Primary Children's Hospital or University of Utah's Medical Center, if they experienced IVH, and if they resided in the catchment area for treatment. The catchment area included the Wasatch front and surrounding rural areas in Utah, Idaho, and Wyoming.

Assignment to groups. Subjects who met the inclusion criteria were identified upon discharge from the respective NICU. Parents of eligible infants were contacted via mail by the medical center in which the infant was a patient the month prior to reaching 3 months CCA. Infants who met the study criteria were considered for inclusion if the parents indicated a willingness to participate in either of the experimental conditions, depending upon where random assignment placed them. Prior to the random assignment, the infants were stratified on severity of hemorrhage and birthweight. Infants were then randomly assigned to the early intervention or delayed intervention conditions by a roll of a four-sided die. Parents were informed of their infant's assignment after they gave approval to participate in the study.

The only person at the site who knew the actual order of eligibility and enrollment of subjects was the EIRI site coordinator. Additionally, the dates on which infants were identified as being eligible for this study were tracked to ensure that infants were assigned in the order in which they were identified.

Demographic characteristics. Demographic information was gathered by questionnaires regarding family composition, parent education and occupation, family income, ethnic background, and primary caretaking responsibilities of the participating families. At the time of the most recent reassessment reported herein, most of the families resided in the urban areas of the Wasatch Front (77%). Thirteen percent lived in surrounding rural areas of Utah, Idaho, or Wyoming. Two subjects lived in California, and one subject each lived in Ohio, Connecticut, and Washington, respectively. Ninety percent of the infants were white and nine percent (5 subjects) were non-white. For each of these "non-white" subjects, one parent is listed as white and one is listed as hispanic or native American, so the sample could essentially be considered white.

All infants lived in homes where English was the primary language, and most all (97%) lived in two-parent families. The educational level of the mothers ranged from 8th grade to college graduate, with a mean education level of 13.1 years. The fathers' education level ranged from 9th grade to Ph.D., with a mean of 13.9 years of education. Annual family incomes ranged from $2,500 per year to over $50,000 per year. Median yearly income for the families was $20,001.

Information concerning the mother's pregnancies was provided by the hospitals. About half of the mothers were rated as being in poor or fair health. For approximately 30% of the group, this was their first pregnancy, and another 33% had previous aborted pregnancies (spontaneous or induced). Most of the mothers were in their 20s, but 7 were 19 or under, and 15 were 30 or older.

The gestational age of the children ranged from 24 to 40 weeks, with only 4 infants reaching a gestationally appropriate age. The children ranged in birthweight from 530 g to 3636 g, with the median weight being 1225 g (i.e., a little under 3 pounds). About one-third of the children's IVH conditions were classified as more serious (grade III or IV). The days spent in the newborn intensive care unit ranged from 0 (for three of the children) to over 90 days (for another three children), with the median length of stay being 27 days. All but three of the children received at least one blood transfusion, and three received over 30 transfusions. The median number of transfusions was seven.

Although random assignment had been completed, group comparisons were completed on family demographic characteristics, mother pregnancy characteristics, and child medical characteristics to investigate ways the early and delayed intervention groups might vary. These comparative analyses for all subjects and those who have completed Reassessment #5 (at age 66 months) are reported in Tables 5.1 through 5.4. Separate tables are included for Reassessment #5 because within the smaller sample, differences in family, maternal, and infant hospital characteristics may be present.

Analysis of family demographic characteristics (Table 5.1) indicated that of the 17 variables on which comparisons were made using a significance level of .10, there was a statistically significant difference between the groups for four variables, including mother's age, father's education level, percent of fathers employed as technical managerial or above, and percent of children who were white. Given the many variables on which comparisons were made, it is not surprising that there were statistically significant differences on several variables. When the data are considered in total, it appears that the groups were very comparable in terms of demographics. The slight advantage which may have existed was in favor of the group that received early intervention.

Table 5.1

Comparability of Groups on Assessment Demographic Characteristics for Salt Lake City Medically Fragile Age-at-Start Study (for Total Sample)

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
Age of child in months at assessment	3.4	(.7)	28	3.3	(.5)	30	.46	-.14
Age of mother in years	25.8	(4.4)	28	28.1	(5.6)	30	.10	.52
Age of father in years	28.0	(5.1)	28	30.2	(5.8)	29	.13	.43
Percent Male[*]	50.0		28	43.3		30	.62	-.12
Years of education for mother[δ]	13.1	(2.3)	28	13.2	(2.0)	30	.87	.04
Years of education for father[δ]	13.4	(2.3)	28	14.3	(2.1)	29	.09	.39
Percent w/both parents living[*+] at home	100		28	93.3		30	.17	-.24
Percent of children who are[*] Caucasian	82.1		28	96.7		30	.07	.41
Hours per week mother employed[δ]	9.6	(16.8)	28	10.2	(15.4)	30	.88	.04
Hours per week father employed[δ]	42.3	(14.7)	25	41.9	(16.1)	26	.93	-.02
Percent of mothers employed[*]	42.9		28	36.7		30	.64	-.12
Percent of fathers employed as[*] technical/managerial or above	21.4		28	44.8		29	.06	.46
Total household income[♦]	$24,179	($17,760)	28	$29,650	($17,307)	30	.24	.31
Percent receiving public assistance[δ*]	28.6		28	23.3		30	.66	-.11
Percent of children in daycare[δ*] more than 5 hours per week	35.7		28	24.1		29	.35	-.31
Number of siblings[δ]	1.2	(1.0)	28	1.5	(1.7)	30	.37	.31
Percent with English as primary[*+] language	100		28	100		30	1.00	.00

[^] Effect size is defined here as the difference between the groups (center + PIE minus center) on the ANCOVA scores, divided by the unadjusted standard deviation of the center-based intervention group (see Cohen, 1977; Glass, 1976; and Tallmadge, 1977 for a more general discussion of the concept of Effect Size). The sign of ES only indicates direction of difference; no value judgment is intended.

[δ] Some reassessment information was used to arrive at these figures.

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[♦] Income data were categorical and were converted by using the midpoint of each interval into continuous data.

[+] One of the groups has no variance.

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Table 5.2

Comparability of Groups on Mother Pregnancy and Child Hospital Characteristics for Salt Lake City Medically Fragile Age-at-Start Study (for Total Sample)

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
Maternal Pregnancy Characteristics								
Maternal Health Rating◆	2.6	(.6)	25	2.1	(1.0)	28	.30	-.83
Diabetes %*	7.1		28	10.0		30	.70	-.08
Bleeding at First Trimester %*	32.1		28	37.9		29	.65	-.11
Placenta Previa %*	0		28	3.3		30		-.13
Received 3 trimesters prenatal* care (%)	60.7		28	53.3		30	.58	-.15
No. of pregnancies♣	2.5	(1.3)	28	3.2	(2.4)	30	.19	|.54|
No. of previous aborted pregnancies♣ (spontaneous/induced)	.4	(.7)	28	.7	(1.3)	30	.33	|.43|
No. pregnancies carried full-term♣	2.3	(1.1)	28	2.7	(1.7)	30	.29	|.36|
Mothers age at birth♣	25	(4.7)	28	26.4	(5.3)	30	.31	|.30|
Maternal Toxemia %*	0		28	0		30		.00
Child Hospital Characteristics								
Birthweight (grams)	1534	(681)	28	1302	(545)	30	.16	-.34
Grade of IVH* (% w/Grade III or IV)	39		28	30		30	.47	.18
Gestational Age (weeks)	30.8	(3.5)	28	29.4	(2.7)	30	.10	-.40
1-Minute Apgar	4.0	(2.5)	28	3.7	(2.4)	29	.63	-.12
5-Minute Apgar	6.1	(2.0)	28	6.2	(1.5)	29	.89	.05
Apnea (%)*	57		28	67		30	.46	-.18
Seizures (%)*	11		28	13		30	.77	-.06
Respiratory Distress Syndrome (%)*	7		28	13		30	.45	-.16
Bronchopulmonary Dysplasia (%)*	61		28	70		30	.47	-.18
Metabolic Acidosis (%)*	18		28	20		30	.84	-.04
Retinopathy of Prematurity*	25		28	33		30	.50	-.17
Hypertension (%)*	4		28	10		30	.34	-.18
No. of postnatal transfusions	8.2	(7.8)	28	10.6	(10.4)	30	.33	-.31
No. of days in NICU	26.1	(27.9)	28	35.5	(33.7)	29	.26	-.34
Medical Severity Index	17.0	(7.9)	28	17.8	(7.6)	30	.67	-.10

^ $ES = \dfrac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$ Negative Effect Sizes indicate that the children in the early intervention group are doing less well than those in the delayed intervention group.

◆ Maternal health is rated poor, fair, good categories (1-3) with higher scores showing better health.

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

♣ No value judgment is made for this variable; ES indicates direction of difference.

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Table 5.3

Comparability of Groups on Assessment Demographic Characteristics for those Subjects Included in 66-Month Analysis for Salt Lake City Medically Fragile Age-at-Start Study

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Age of child in months at assessment	3.3	(.6)	19	3.2	(.5)	21	.89	-.17
• Age of mother in years	25.8	(4.4)	19	28.1	(6.3)	21	.20	.52
• Age of father in years	27.1	(4.8)	19	31.0	(6.1)	20	.03	.81
• Percent Male[*]	42.1		19	43.9		21	.96	.02
• Years of education for mother[δ]	13.2	(2.3)	19	13.0	(2.1)	21	.77	-.09
• Years of education for father[δ]	13.6	(2.3)	19	14.3	(2.2)	20	.40	.30
• Percent w/both parents living[*] at home	100.0		19	95.2		21	.68	-.15
• Percent children who are Caucasian[*]	84.2		19	95.2		21	.27	.30
• Hours per week mother employed[δ]	13.7	(19.1)	19	9.7	(14.9)	21	.47	-.21
• Hours per week father employed[δ]	45.3	(13.6)	16	44.4	(16.1)	18	.87	-.07
• Percent of mothers employed[*]	64.7		17	66.7		18	.90	.04
• Percent of fathers employed as[*] technical/managerial or above	31.6		19	45.0		20	.39	.24
• Total household income[♣]	$28,684	($19,671)	19	$31,452	($18,472)	21	.65	.14
• Percent receiving public assistance[δ*]	26.3		19	23.8		21	.86	-.05
• Percent of children in daycare[δ*] more than 5 hours per week	42.1		19	30.0		20	.43	-.22
• Number of siblings[δ]	1.3	(.9)	19	1.6	(1.9)	21	.45	.33
• Percent with English as[+*] as primary language	100		19	100		21		.00

[^] $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

For this table, the sign of ES indicates direction of difference only, no value judgement is intended.

[δ] Some reassessment information was used to arrive at these figures.

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[♣] Income data were categorical and were converted by using the midpoint of each interval into continuous data.

[+] One of the groups has no variance.

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Table 5.4

Comparability of Groups on Mother Pregnancy and Child Hospital Characteristics for those Subjects Included in 66-Month Analysis for Salt Lake City Medically Fragile Age-at-Start Study

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• **Mother Pregnancy Characteristics**								
Maternal Health Rating[♦]	2.6	(.6)	17	2.2	(1.0)	20	.09	-.67
Diabetes %[*]	5.3		19	14.3		21	.35	-.23
Bleeding at First Trimester %[*]	42.1		19	40.0		20	.89	.04
Placenta Previa %[*]	0		19	0		21		.00
Drug Use	4.1	(2.2)	17	3.9	(2.0)	20	.82	.09
Received 3 trimesters of prenatal care	68.4		19	42.8		21		-.53
No. of pregnancies[♣]	2.5	(1.2)	19	3.3	(2.7)	21	.22	|.67|
No. previous aborted pregnancies[♣] (spontaneous/induced)	.5	(.8)	19	.7	(1.5)	21	.71	|.25|
No. pregnancies carried full-term[♣]	2.3	(1.1)	19	2.8	(2.0)	21	.28	|.45|
Mothers age at birth[♣]	24.8	(4.5)	19	26.1	(5.8)	21	.43	|.29|
Maternal Toxemia %[*]	0		19	0		21		.00
• **Child Hospital Characteristics**								
Birthweight (grams)	1552.6	(751.8)	19	1312.8	(546.2)	21	.25	-.32
Grade of IVH[*] (% w/Grade III or IV)	53		19	33		21	.22	.39
Gestational Age (weeks)	31.0	(3.9)	19	29.5	(2.9)	21	.16	-.38
1-Minute Apgar	4.2	(2.5)	19	3.8	(2.7)	20	.67	-.16
5-Minute Apgar	6.1	(2.2)	19	5.9	(1.6)	20	.80	-.09
Apnea (%)[*]	52.6		19	61.9		21	.55	-.17
Seizures (%)[*]	15.8		19	19.0		21	.79	-.07
Respiratory Distress Syndrome (%)[*]	5.3		19	14.3		21	.34	-.23
Bronchopulmonary Dysplasia (%)[*]	57.9		19	71.4		21	.37	-.25
Metabolic Acidosis (%)[*]	0		19	9.5		21	.17	-.28
Retinopathy of Prematurity[*]	12.5		16	10.5		19	.85	.06
Hypertension (%)[*]	0		19	4.8		21	.34	-.15
No. of postnatal transfusions	9.2	(8.7)	19	11.9	(11.2)	21	.42	-.31
No. of days in NICU	29.4	(30.1)	19	40.4	(32.8)	20	.29	-.37
Medical Severity Index	17.1	(8.3)	19	17.5	(7.9)	21	.89	-.05

[^] $$\text{ES} = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

Negative ES indicates that the early intervention group is doing less well than the delayed intervention group.

[♦] Maternal health is rated poor, fair, good categories (1-3) with higher scores showing better health.

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[♣] No value judgement is made for this variable; ES indicates direction of difference.

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A comparison of the mothers' pregnancy characteristics, infants' medical characteristics (see Table 5.2) indicated that at assessment, the groups were similar on the pregnancy and medical characteristics. The only exception which is statistically significant is that children in the delayed intervention group had a higher gestational age ($\underline{p}$ = .10; ES = -.40) than the children in the early intervention group. Several other variables, which were not statistically significant, indicate that the delayed intervention group had a slight advantage at assessment over the early intervention group. For example, children in the delayed intervention group were heavier (ES = -.34) and spent fewer days in the NICU (ES = -.34) and had fewer transfusions (ES = -.31). Although not statistically significant, these differences were considered to be important and were considered as potential covariates in the analyses reported later in this report.

The comparison of demographic, mother pregnancy, and child characteristics for those tested thus far at the 66-month reassessment (#4) (shown in Tables 5.3 and 5.4) demonstrated that these two limited groups were also very comparable. Approximately the same differences that existed with the total sample exist with this group of 40 families.

Subject attrition. To minimize attrition, the interveners and site coordinator in this project maintained updated telephone numbers and addresses for the participants. Data were collected in person or by mail approximately every 6 months for the child's first 18 months and monthly contacts were attempted after 18 months, so there was frequent contact with the families. For several years, a semiannual newsletter kept parents informed of the study. Since then, Christmas cards, birthday cards, and reports of the annual assessments have been sent to the families in order to keep the families involved and partly to keep addresses updated. Arrangements were also made to provide intervention services and assessment for those participants who moved to another state.

Despite the efforts to minimize attrition, a few children were lost from the study. At the first reassessment (18 months CCA), all 58 children participated in the testing; at Reassessment #2 (30 months CCA), all but one child participated; at Reassessment #3 (40 months) all children but one who had died after Reassessment #2 participated. Testing is completed for these three reassessments. Forty-eight children have been tested for Reassessment #4 (54 month), and 39 have completed Reassessment #5 (66 months). Although the fourth and fifth assessments are not completed, some children were not assessed who were old enough to participate. One subject has only been assessed twice (at Reassessments #1 and #3). Since then, the mother refuses to be contacted. Two subjects died (one after Reassessment #2 and one after Reassessment #4). One other subject was not located in time to participate in Reassessment #4, and one was not assessed because of an earlier age adjustment error.

Intervention Programs

The intervention was conducted in two phases for this project. The first phase provided sensorimotor intervention to the early intervention (experimental) group beginning at 3 months CCA, while the delayed intervention (control) group received the current level of community service (referral to the NICU follow-up clinic or assistance from their physician). The second phase, delayed intervention, was received by all infants in both groups. Delayed intervention began when the infants reached 18 months CCA and consisted of individualized home-based intervention services based on the Curriculum and Monitoring System (CAMS), and sensory motor intervention provided if needed by a physical therapist. A tabular summary of the alternate intervention in treatments is presented in Table 5.5.

Table 5.5

Treatments

Early Group	Delayed Group
3-18 Months	
• Sensorimotor Evaluation by PT or OT	
• Home visits by PT, 1 or 2 per month*	
• Treatment flexible but focused on sensorimotor development	
• Availability of neonatal care at hospitals	• Availability of neonatal care at hospitals
• Referral to State Department of Health Neonatal Follow-up Clinic	• Referral to State Department of Health Follow-up Clinic
• Availability of follow-up with physician	• Availability of follow-up with physician
18 Months + (Both Groups)	
• Home visits (1 per month) by Early Childhood Special Educator^	
• Visitor modeled and taught mother developmentally appropriate^ behaviors with child and set goals	
• Motor intervention provided by PT or OT, as needed	

* Flexible schedule, depended on needs of infant ($\bar{x}$ visits = 17, range = 1-36)

^ Flexible schedule, depended on needs of children during the time. During the time of the study, P.L. 99-457 was implemented. Thus, services were provided either by the study's early childhood special educator, or arrangements were made to place child in other ongoing programs.

Early intervention service. At three months CCA, children in the early intervention group were evaluated by a licensed physical or occupational therapist for an initial sensorimotor evaluation using the CAMS Motor Placement Test. At that time, scheduling and programming were discussed with the family. Frequency of intervention was determined by CAMS test scores, the type and quality of the infant's movement patterns, and the amount of interactive time the parents had available. Most infants were seen one or two times per month during the first few months when movement patterns were limited. The treatment schedule was flexible so that weekly visits were scheduled if abnormal patterns or tone were noted, or if significant delays persisted. However, if normal development with good quality of movement was occurring, intervention was limited to monthly visits. Generally, infants who received more visit were perceived by the physical therapist as needing more intervention. Similar levels of early intervention program intensity for low birthweight infants have been described by Resnick et al. (1987; 1988), Raugh et al. (1988), Field et al. (1980), Nurcomb et al. (1984), and Piper et al. (1986).

Treatments consisted of individualized activities designed to encourage appropriate movement patterns in a normal developmental sequence. The activities were updated constantly tc accommodate progress and were designed to be integrated into daily family routines. Parents were present during treatment sessions which lasted 45 minutes and included a review of progress on treatment goals, direct therapy, and an opportunity for the parent to work with the child. Parents were provided with written and illustrated home program activities. Parents were asked to work with the child at home at least 20 minutes per day, five days per week, on techniques they had learned in the intervention sessions.

Attendance and progress were monitored on an ongoing basis by the site coordinator by reviewing the therapist's progress notes. The CAMS placement test checklist was updated as goals were met. If a child required other equipment or services, or if the family needed financial assistance to buy rehabilitation equipment, the physical therapist referred the family to agencies in the Salt Lake City area or attempted to obtain equipment no longer being used by other children. The physical therapist also maintained a supply of equipment which she provided to subjects at no-cost. If a child moved out of state, intervention was arranged with local therapists if needed and was paid for by the research project. Progress was monitored by phone calls with family and/or reports from physical therapists.

As was explained earlier, the children in the delayed intervention group received no intervention through the project during this time period. Upon release from the hospital, they were referred to the Utah State Department of Health Neonatal Follow-up Clinic or follow-up from private physicians. They were free to access other services in the community, if they desired.

Delayed intervention. At 18 months corrected age, the infants in the delayed intervention group also began to receive intervention services. The focus of intervention became home-based intervention for both the early and delayed intervention groups. Therefore, all children at 18 months corrected age were assessed using the CAMS, and individual goals were established for intervention.

The Curriculum and Monitoring Systems (CAMS) was designed to meet the educational needs of young children with disabilities served by the Multi-Agency Project for Preschoolers (MAPPS). The project collected data attesting to the efficacy of the program and was validated as an exemplary program for national dissemination by the Joint Dissemination Review Panel (JDRP) of the U. S. Department of Education. It was revalidated in 1985. MAPPS is one of only 21 early intervention projects validated by the JDRP. MAPPS is also a National Diffusion Network (NDN) program and has replication sites nationwide.

Each of the CAMS programs is printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. With training, CAMS can be used by parents, teachers, and paraprofessionals in the home or in an institutional/school setting. The five CAMS programs are: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development.

The ***Receptive Language Program*** teaches the student skills that do not require verbalization but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The ***Expressive Language Program*** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building and articulation.

The ***Motor Program*** is designed to teach gross and fine motor skills. The program stimulates normal motor development, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The ***Self-Help Program*** is designed to teach basic skills for self-care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The ***Social-Emotional Program*** is designed to teach basic social-emotional skills, including both child-adult and peer interactions.

The child development specialist met with the parent and child for one-hour once each month and provided intervention in the area(s) of need identified by the CAMS placement test and by parent concerns. The parent was asked to spend 20 minutes each day 5 days each week providing similar intervention with their child at home. The child development specialist talked with the parent via telephone at least once between clinic appointments to check on progress and answer questions.

Typically, a monthly home visit by the child development specialist established goals for the child dependent upon the CAMS placement test. Some professionals will raise the question of whether the one-time-per-month service is of sufficient quantity. Although some home-based early intervention programs are more intensive than one-time-per-month, a survey of Roberts and Wasik (1990) of 643 home-based early intervention programs demonstrated that the one-time-per-month visit was the most typical service delivery option. Hence, this program is certainly consistent with typical practice. Furthermore, it should be remembered that the particular approach to early intervention used in this project was based on a nationally validated JDRP approved curriculum. Of course, the possibility remains that a more intensive program would have resulted in different findings, and that issue needs to be addressed with additional research. A typical intervention session was 45-60 minutes in duration. Each session began by asking how the child was doing and followed up on any problems (medical, family, etc.) discussed at the last visit. Then, using CAMS, the intervener assessed the child's progress on the items suggested for home activities in the previous session. If the child passed these items, new activities were suggested and demonstrated. Following the assessment, the intervener and child played with selected toys designed to teach age-appropriate skills (shape sorters, bead stringing, puzzles, etc.). Before the session ended, the intervener wrote down the suggested activities, gave examples showing how to teach these activities, provided appropriate toys if necessary, and answered any questions the parent had.

For example, if the objective for a child was to point out facial features, the child development specialist taught the parent an exercise to teach the child facial features. When the next meeting occurred, the child development specialist asked the child to point out facial features. If the child showed competence in that area, a new objective was established. Some children had objectives in several domains, while others had only one. The child development specialist provided recommendations to parents regarding problems or concerns such as toileting or behavior.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, he/she also received motor intervention from the physical therapist following the CAMS program. Those children in the early intervention group who still required motor services continued meeting with the physical therapist. If a child who received motor services in the early intervention group no longer required those services, s/he terminated services with the physical therapist and received services from the child development specialist only. The physical therapist followed the same procedures outlined in the early intervention service section. Again, for those children living out of state, the site coordinator arranged for intervention with local agencies when needed and possible, and children were monitored through phone calls to parents.

Midway in the study, the focus of service provision changed slightly as appropriate community services became more available to young children with disabilities. In compliance with P.L. 99-457, the Utah Departments of Health and Education developed more early intervention and education programs to meet the special needs of these children. While children in the study continued to receive the interventions as previously described, parents were assisted in accessing community services when their children entered the delayed intervention phase. Children received both public and private preschool services, occupational, physical, and speech/language therapies, and services to the hearing and visually impaired. In sum, all children had been involved in individualized intervention services at 18 months CCA and thereafter. The frequency of the intervention varied. Some children also obtained other services in the community. The access of services by the family was monitored on a yearly basis by parents completing an "additional services form." The results of that assessment are discussed later.

With the ending of the funding for initial grant (September 1, 1990), the home visits made by the project staff ceased. Although the intervention portion of the project was finished, the site coordinator continued to attempt to find community programs for the families, when requested to do so by the family. With the intervention portion of the study being over but the research portion continuing, it seems appropriate to describe the sample's intervention or education program at that time. As of September 1, 1991, 14 children were attending kindergarten; two of these were involved with special education programs. The one attending the Utah School for the Deaf was from the control group, and the other attending a program for children who had experienced IVH, was from the experimental group. Of the 16 children in preschool, one child from the control group, and two children from the experimental group were attending special education preschool programs. Time spent in these programs averaged 35 hours each week during the school year. One child (in the intervention group) attended a Head Start program, which also ran for 35 hours each week during the school year. Weekly speech therapy sessions were received by six children from the control group (the average weekly time being one hour and 10 minutes) and two children from the experimental group (the average weekly time being three hours.) Physical therapy was received by three of the control subjects (averaging 1-1/2 hours each week), and seven of the experimental subjects (averaging two hours each week.)

Treatment Verification

In order to decide if an intervention is beneficial, it is extremely important to know whether the treatment was implemented. Therefore, a number of procedures were implemented to verify that treatment was implemented as intended. Table 5.5 shows treatment verification data. Verification data included intervention provided by project and by additional services, that were arranged for by project or parents, parent satisfaction ratings, and site visits.

Intervention sessions provided by project. Both home visits and clinic visits were recorded in the subject's file. These were summed together and appear on Table 5.6 under "number of intervention sessions provided by project." Only the early intervention group received these services during the 3- to 18-month age period, and services focused on sensory motor intervention. All children in the study received home-based services provided by the project after they reached 18 months of age; services included developmental intervention and motor intervention, if needed.

Table 5.6

Treatment Verification Data for the Salt Lake City Medically Fragile Age at Start Study

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
3-18 MONTH Reassessment #1								
• No. of early intervention sessions[&*]	-----		28	17.0	(10.2)	30	---	---
• Additional Services[$]								
Hours of speech therapy	.4	(1.9)	28/3[♦]	1.0	(3.4)	30/6[♦]	.41	.30
Hours of physical therapy	20.1	(62.9)	28/9	14.1	(44.4)	30/9	.67	-.10
Daycare	86.1	(274.4)	28/4	158.5	(407.2)	30/9	.43	.26
Preschool	0	(0.0)	28/0	0	(0.0)	30/0	---	---
• Parent rating of satisfaction[#*] with program	-----		28	3.9	(.3)	25	---	---
19-30 MONTH Reassessment #2								
• No. of early intervention sessions[&]	10.2	(12.5)	26	14.4	(18.9)	28	.34	.34
• Additional Services[$]								
Hours of speech therapy	1.2	(4.1)	26/3[♦]	.1	(.4)	29/1[♦]	.15	-.27
Hours of physical therapy	24.9	(81.0)	26/6	5.1	(12.7)	29/6	.20	-.24
Daycare	206.9	(424.0)	26/7	279.7	(523.3)	29/9	.58	.17
School	46.2	(117.4)	26/4	35.1	(148.7)	29/5	.76	-.09
• Parent rating of satisfaction[#] with program	3.7	(.5)	16	3.8	(.4)	14	.56	.20
31-42 MONTHS Reassessment #3								
• No. of early intervention sessions[&]	4.7	(6.3)	25	7.0	(9.8)	26	.31	.37
• Additional Services[$]								
Hours of speech therapy	12.1	(49.2)	26/4[♦]	3.6	(15.6)	27/2[♦]	.39	-.17
Hours of physical therapy	17.2	(53.4)	26/6	1.5	(7.7)	27/1	.15	-.29
Daycare	255.2	(560.0)	26/8	337.8	(588.1)	27/9	.60	.15
School	103.5	(154.3)	26/12	83.6	(252.2)	27/6	.73	-.13
• Parent rating of satisfaction[#] with program	3.5	(.8)	18	3.7	(.5)	19	.28	.25

(continued)

[^] $\text{ES} = \dfrac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$ The sign of ES indicates direction of difference only; no value judgment is intended

[#] Parents involved in each alternative type of intervention rated their satisfaction with the program on a four-point scale (4 = excellent, 3 = good, 2 = fair, 1 = poor) in response to seven questions, the response to overall satisfaction is reported here.

[$] Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., daycare, preschool, physical therapy) was obtained via a parental questionnaire.

[*] Infants and families in the Delayed Intervention group received 0 early intervention services from the SLC/IVH project prior to 18 months of age; therefore, total intervention sessions received and parent rating of satisfaction are not reported.

[&] These services included sessions with a physical therapist or an early childhood specialist, except that prior to 18 months of age (Reassessment #1) only sensory motor intervention was provided.

[♦] Few families accessed additional services; hence, the number of families reporting a particular service is included along with the number who completed the survey (e.g., 28/3 indicates that 28 parents completed the form, but only 3 reported that particular service.

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Table 5.6 (continued)

Treatment Verification Data for the Salt Lake City Medically Fragile Age at Start Study

	All Subjects Included in Analyses							
	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
43-54 MONTH Reassessment #4								
• No. of early intervention sessions[&]	4.7	(10.1)	25	8.2	(21.5)	25	.46	.37
• Additional Services[$]								
Hours of speech therapy	12.6	(34.9)	22/5[♦]	3.5	(16.8)	23/1[♦]	.28	-.26
Hours of physical therapy	19.5	(44.2)	22/6	16.1	(54.3	23/3	.82	-.08
Daycare	119.3	(426.9)	22/5	333.3	(549.8)	23/8	.15	.50
School	346.7	(361.7)	22/17	421.4	(844.4)	23/11	.70	.21
• Parent rating of satisfaction[#] with program	3.7	(.5)	11	3.5	(.5)	10	.31	-.40
55-66 MONTH REASSESSMENT #5								
• No. of early intervention sessions[&]	4.5	(7.2)	12	8.2	(19.3)	10	.58	.51
• Additional Services[$]								
Hours of speech therapy	78.2	(261.8)	17/5	3.0	(12.0)	16/2	.25	-.29
Hours of physical therapy	20.9	(67.4)	17/3	6.8	(18.6)	16/2	.41	-.21
Daycare	649.4	(791.1)	17/9	81.3	(228.7)	16/2	.01	-.72
School	293.9	(327.6)	17/11	421.3	(668.3)	16/10	.35	.39

^ $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

The sign of ES indicates direction of difference only; no value judgement is intended.

[#] Parents involved in each alternative type of intervention rated their satisfaction with the program on a four-point scale (4 = excellent, 3 = good, 2 = fair, 1 = poor) in response to seven questions, the response to overall satisfaction is reported here.

[$] Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., daycare, preschool, physical therapy) was obtained via a parental questionnaire.

[&] These services included sessions with a physical therapist and/or an early childhood specialist.

[♦] Few families accessed additional services; hence, the number of families reporting a particular service is included along with the number who completed the survey.

Regular phone contacts were also made with subjects (with only the early intervention group until 18 months of age), monitoring progress, making appointments, and checking on services, if subjects were living out of the area. Records of these phone contacts with parents were recorded in the interventionist's notes.

The mean number of intervention sessions during the 3- to 18-month age period for the early intervention group was 17.0, with the number of sessions ranging from

1 to 36. Table 5.7 presents the frequency data for the intervention sessions attended for these children in the early intervention group. Three children received less than 5 visits, and an additional 9 received less than 15 visits, which would have been the number if each child had been visited monthly as planned. Forty percent of the children received 20 or more visits. The problems associated with providing optimal frequency of intervention will be discussed at the end of this section. For the children who received 30 or more sessions with the project therapists, the therapist's notes portray children who had severe problems.

At Reassessments #2, #3, #4, and #5, the intervention received directly through the project, and additional intervention arranged by the project or parents are also reported on Table 5.6. The children in the early intervention group consistently received more intervention through the project than did the delayed intervention group, but the differences are not statistically significant. On the other hand, the delayed group usually received more speech and physical intervention and school through other services, but the differences did not reach the .10 level of statistical significance. Including intervention sessions provided by project and hours of speech and physical therapy and school, the two groups of children received approximately comparable intervention. Possibly, the liaisons formed with the project while the child was very young explains why there is a difference in where the children received the intervention.

An analysis of this intervention participation data demonstrates that often neither the physical therapist nor the developmental specialist were able to provide the optimal number of intervention visits. For example, Table 5.7 indicates that 21 of the 30 infants in the early intervention group received 10 or more visits, which was approximately the suggested minimal number of monthly visits. Between the ages of 18 and 30 months, monthly visits were still encouraged; however, fewer visits were appropriate if the child was receiving other intervention. After that time, the frequency of visits was decided on a case by case basis, with fewer than monthly visits sometimes being recommended. Notations were kept by the physical therapist or the developmental specialist for each visit completed, each visit attempted, and each visit scheduled. Many problems in the families' lives (e.g., child or mother illness, changes in jobs, transportation, marital and financial problems) were cited. The number of cancelled or missed appointments was high. For example, the notations for one subject listed two completed intervention sessions versus 10 no shows. Several examples indicate the range of reasons for low participation. One mother agreed to participate in the assessments, but not in the intervention sessions. She felt that it would make her child consider herself disabled. In another family, the child in the study was the least disabled of the three children. The mother did not have time to participate because of all that she had to do with her other children. Finally, many parents in the sample did not think their children needed intervention, they felt they were doing fine, considering they were "young" for their age group, and they felt that the children would grow out of any delay. Finally, children who lived in rural areas or moved from the catchment area typically did not receive intervention unless the parent perceived a significant need for such services.

Table 5.7

Frequency of Intervention Service Visits for the Early Intervention Groups Ages 3 to 18 Months for the Salt Lake City Medically Fragile Age-at-Start Study

	Frequency	Percent	Cumulative %
Less than 5 visits	3	10.0	10.0
5 to 9 visits	6	20.0	30.0
10 to 14 visits	5	16.7	46.7
15 to 19 visits	4	13.3	60.0
20 to 24 visits	4	13.3	73.3
25 to 29 visits	4	13.3	86.7
30 and more visits	4	13.3	100.0
TOTAL	30	100.0	

Additional services. Annually, parents completed a survey reporting additional services the child had received for the previous year. These additional services included speech therapy, physical and occupational therapy, daycare, and preschool. The project director and/or home visitor sometimes helped families access other services as these services became available in the communities and families found services on their own. These services are recorded as additional services. Across reassessments, the majority of families did not access any type of additional services. Less than 25% of the sample reported accessing speech therapy or physical therapy at any given reassessment. For example, the number who did participate in the various categories are noted in Table 5.6. Under column "n," for example, 28/3 indicates that 3 of the 28 subjects accessed that particular service. In addition to the average scores reported in Table 5.6, medians were computed for the speech therapy, physical therapy, and preschool at Reassessments #1, #2, #3, and #4. All the medians were 0, again indicating that most of the children in the two groups did not receive additional services.

It is of particular importance to know if the delayed intervention group accessed other interventions before the 18-month reassessment, because if they did, there would be no treatment difference between groups. There was great variability within groups in terms of number of hours of services received, but the services the group received were minimal. Consequently, treatment differences in sensory motor intervention did exist between the early intervention and delayed intervention groups during the early intervention stage, but did not exist after the 18-month reassessment.

Parent satisfaction with program. Another aspect of treatment verification is whether the parents were satisfied with the intervention services delivered by the program. Annually, parents were requested to complete a questionnaire regarding their satisfaction with the intervention services delivered by this program. The questionnaire consisted of seven program qualities that were rated on a scale of 1-4, with 4 being the most favorable rating. The final item requested a rating of parent satisfaction with the program in general. At Reassessment #1, the early intervention group's mean rating of satisfaction with the program was 3.9, indicating very favorable satisfaction (see Table 5.6). At the later reassessments, parents in both the early and delayed intervention groups consistently rated the intervention favorably.

Site review. Formal site reviews were conducted during each year of the project. The last formal site review of the Salt Lake City IVH project was completed on August 17, 1990. Those participating in the site review included the site coordinator, the physical therapist, and two child development specialists. The purpose of the site reviews was to collect information about the nature and quality of early intervention services that were delivered to verify that the research conducted by EIRI was implemented as intended, and to collect needs assessment data which would be useful to site administrators.

The site review was conducted as a part of the treatment verification process which is described in the Treatment Verification Handbook for Research Sites (EIRI, 1988), and was implemented according to the general procedures described in the Guide for Site Reviews of EIRI Research Sites, which is found in Part II of the handbook. The site review took place at K2D2, the facility where most sensorimotor and CAMS interventions were delivered and included a review of eight randomly-selected subject records, observations of one sensorimotor and one CAMS intervention session, interviews with interveners, and inspection of the facility.

The review team found that there were substantial differences in the services provided to the two groups prior to 18 months. Intervention services judged to be of high-quality were provided to the early intervention group prior to 18 months CCA and to both groups after 18 months CCA. Assessment procedures were carried out regularly, appropriate plans and records documenting interventions and child progress were in place. It was found that several of the older subjects in the study were working on the final objectives in the CAMS curriculum.

Contextual Variables

Other events transpired in the families' lives during the intervention that might affect child development or family functioning. It is important to know if these other contextual factors differed between the two groups because these factors might have influenced the child and family outcome measures.

Family demographic variables, reports of family resources, family functioning, and other family stresses, the child's health, and the intervener's rating of the parent's participation in the intervention, were the contextual factors analyzed. Consequently, demographic data that were subject to change, including family composition, hours mother works, total income, and percent receiving public assistance were collected at each reassessment. As can be seen in Table 5.8, the groups appear very comparable on the demographic factors and the reports of other family stresses, resources, adaptability, and cohesion across reassessments. The only statistically significant difference is for adaptability at Reassessment #5. One statistical difference in 20 is likely to be a random fluctuation.

Parents also completed a Child Health Survey at each reassessment. The item rating the child's general health (reported in Table 5.8) is rated from 1 (health condition worse than other children) to 3 (health condition better than other children). Group means range from 1.7 to 2.2, indicating average health. At the 30-month and 42-month reassessment there were statistically significant differences with the children's health being rated higher for the early intervention group than it was for the delayed intervention group.

Table 5.8
Comparability of Contextual Factors for the Delayed and Early Intervention Groups for the Salt Lake City Medically Fragile Age-at-Start Study

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
18-MONTH REASSESSMENT #1								
• Key Family Demographics								
Child living with both parents (%)	85.7		28	93.3		30	.35	.22
Mother's hrs. of work per week	11.8	(17.0)	27	13.9	(16.9)	29	.65	.12
Total income	$27,827	(20,629)	26	$33,111	($21,011)	27	.36	.26
% receiving public assistance	29.6		27	30.0		30	.98	-.01
• Family Functioning								
Family Stress (FILE)♦	12.0	(6.3)	28	10.8	(6.8)	28	.48	.19
Family Resources (FRS)&	121.9	(18.2)	28	130.1	(21.1)	29	.12	.45
Family Adaptability and Cohesion (FACES)+								
Adaptability (range 16 to 33)	24.0	(5.3)	28	23.3	(6.6)	28	.64	-.14
Cohesion (range 28 to 50)	41.4	(5.2)	28	43.8	(7.0)	28	.39	.25
Child Health●	1.7	(.5)	18	2.0	(.6)	22	.17	.65
• Infant Temperament Questionnaire♣								
Activity	430.7	(69.9)	27	433.1	(58.4)	30	.89	-.03
Rhythmicity	277.8	(61.7)	27	266.5	(68.8)	30	.52	.18
Approach	266.4	(55.0)	27	270.6	(86.9)	30	.83	-.08
Adaptability	243.8	(54.4)	27	239.1	(52.6)	30	.74	.09
Intensity	361.6	(80.7)	27	349.9	(71.5)	30	.56	.14
Mood	310.1	(60.1)	27	291.6	(71.1)	30	.30	.31
• Intervener Rating of Parents▲*								
Attendance				2.6	(.6)	25		
Support				2.3	(.6)	25		
Knowledge				2.2	(.7)	25		
30-MONTH REASSESSMENT #2								
• Key Family Demographics								
Child living with both parents (%)	88.9		27	89.7		29	.93	.03
Mother's hrs. of work per week	12.2	(15.6)	26	13.7	(17.4)	24	.75	.10
Total income	$29,630	($20,157)	27	$30,982	($23,349)	28	.82	.07
% receiving public assistance	26.9		26	34.6		26	.56	-.15
• Family Functioning								
Family Stress (FILE)♦	11.1	(7.9)	27	9.7	(6.3)	29	.46	.18
Family Resources (FRS)&	120.3	(20.8)	27	125.9	(18.7)	29	.29	.27
Family Adaptability and Cohesion (FACES)+								
Adaptability (range 16 to 33)	24.8	(7.3)	27	24.0	(5.1)	29	.66	-.11
Cohesion (range 28 to 50)	41.7	(5.1)	27	42.6	(4.8)	29	.51	.18
• Child Health●	1.8	(.6)	26	2.1	(.6)	26	.09	.50
• Toddler Temperament Scale♣								
Activity	375.3	(79.5)	25	385.5	(71.7)	27	.63	-.13
Rhythmicity	286.4	(87.6)	25	267.6	(59.5)	27	.37	.21
Approach	317.5	(106.1)	25	309.3	(106.2)	27	.78	.08
Adaptability	293.3	(87.6)	25	287.2	(80.7)	27	.80	.07
Intensity	387.2	(79.9)	25	386.3	(88.0)	27	.97	.01
Mood	306.7	(80.3	25	284.3	(64.9)	27	.27	.28
• Intervener Rating of Parents▲*								
Attendance	2.8	(.5)	24	2.4	(.8)	26	.09	-.80
Support	2.7	(.6)	23	2.3	(.7)	26	.03	-.67
Knowledge	2.7	(.5)	24	2.2	(.8)	26	.01	-1.00

(continued)

^ $ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$ Negative ES indicates that the early intervention group is doing better than the delayed intervention group.

♦ Analyses for the FILE are based on raw scores. Lower scores are considered better.

+ Linear scoring (Olson, 1991) is used; hiher scores are considered better.

& Analyses for the FRS are based on raw scores indicating number of resources indicated by the family as being available. Higher scores and positive ESs are considered better.

♣ On the temperament scales, aspects of temperament are reported by parent on a scale of 1 to 6. Lower scores represent temperament aspects that are more easily handled. Hence, lower scores are better.

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Table 5.8 (continued)
Comparability of Contextual Factors for the Delayed and Early Intervention Groups for the Salt Lake City Medically Fragile Age-at-Start Study

	Delayed Intervention			Early Intervention				
	x̄	(SD)	n	x̄	(SD)	n	p Value	ES^
42 MONTH REASSESSMENT #3								
• Key Family Demographics								
Child living with both parents (%)	81.5		27	88.9		27	.45	.19
Mother's hrs. of work per week	12.7	(19.2)	25	16.5	(18.2)	27	.47	.20
Total income	$32,870	($24,285)	27	$34,800	($25,500)	27	.78	.08
% receiving public assistance	37.0		27	32.1		28	.71	.10
• Family Functioning								
Family Stress (FILE)♦	9.9	(5.8)	27	9.4	(6.0)	28	.72	.09
Family Resources (FRS)&	122.9	(19.8)	27	123.9	(19.2)	28	.86	.05
Family Adaptability and Cohesion (FACES)+								
Adaptability (range 16 to 33)	23.8	(4.3)	27	24.3	(4.1)	28	.70	.12
Cohesion (range 28 to 50)	41.2	(4.9)	27	41.3	(4.3)	28	.98	.02
• Child Health@	1.9	(.4)	27	2.1	(.5)	27	.09	.50
• Intervener Rating of Parents^*								
Attendance	2.9	(.3)	20	2.5	(.7)	24	.02	-1.29
Support	2.7	(.6)	20	2.7	(.6)	24	.93	.00
Knowledge	3.0	(.2)	20	2.7	(.5)	24	.02	-1.36
54 MONTH REASSESSMENT #4								
• Key Family Demographics								
Child living with both parents (%)	85.0		26	89.4		19	.65	.12
Mother's hrs. of work per week	16.0	(18.2)	24	17.1	(17.6)	20	.83	.06
Total income	$33,580	($22,230)	24	$39,175	($25,480)	20	.44	.25
% receiving public assistance	26.9		26	21.0		19	.66	.13
• Family Functioning								
Family Stress (FILE)♦	8.9	(5.1)	25	9.8	(7.7)	22	.62	-.18
Family Resources (FRS)&	124.8	(20.2)	25	126.0	(17.8)	20	.83	.06
Family Adaptability and Cohesion (FACES)+								
Adaptability (range 16 to 33)	21.8	(5.3)	25	25.0	(5.6)	21	.05	.60
Cohesion (range 28 to 50)	41.2	(4.6)	25	42.5	(3.3)	21	.31	.28
• Child Health@	2.0	(.6)	24	2.2	(.5)	21	.36	.33
• Behavioral Style Questionnaire♠								
Activity	383.5	(64.1)	24	373.3	(59.4)	22	.58	.16
Rhythmicity	321.7	(68.4)	24	304.0	(51.9)	22	.33	.26
Approach	293.5	(93.5)	24	304.5	(84.7)	22	.68	-.12
Adaptability	312.9	(88.6)	24	271.3	(66.5)	22	.08	.47
Intensity	430.1	(70.7)	24	432.6	(48.7)	22	.89	-.04
Mood	348.8	(84.4)	24	330.4	(73.3)	22	.44	.22
• Intervener Rating of Parents^*								
Attendance	2.6	(.5)	10	2.4	(.6)	5	.50	-.38
Support	2.7	(.5)	10	2.2	(.8)	5	.16	-1.04
Knowledge	2.5	(.5)	10	2.2	(.8)	5	.41	-.57

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^ $ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$ Negative ES indicate the early intervention group is doing less well than the delayed intervention group.

(continued)

* Scores based on a three-point rating (1 = low, 2 = average, 3 = high) completed by the intervenor most involved with the family. Infants and families in the Delayed Intervention group received no early intervention services from the SLC/IVH project prior to 18 months of age and therefore, Intervenor Ratings of Parents are not reported.

$ Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., home nursing, physical therapy, tutoring) was obtained via a parental questionnaire.

+ Linear scoring (Olson, 1991) is used; higher scores are considered better.

@ Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

♦ Analyses for the FILE are based on raw scores. Lower scores are considered better.

& Analyses for the FRS are based on raw scores indicating number of resources indicated by the family as being available. Higher scores and positive ESs are considered better.

♠ On the temperament scales, aspects of temperament are reported by parent on a scale of 1 to 6. Lower scores represent temperament aspects that are more easily handled. Hence, lower scores are better.

Table 5.8 (continued)

Comparability of Contextual Factors for the Delayed and Early Intervention Groups for the Salt Lake City Medically Fragile Age-at-Start Study

	Delayed Intervention			Early Intervention				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
66-MONTH REASSESSMENT #5								
• Key Family Demographics								
Child living with both parents (%)	78.8		18	100		17		.26
Mother's hrs. of work per week	19.9	(18.1)	14	16.8	(17.9)	17	.64	-.17
Total income	$38,805	($26,070)	18	$40,250	($27,736)	18	.87	.06
% receiving public assistance	27.8		18	17.7		17	.49	.22
• Family Functioning								
Family Stress (FILE)[◆]	8.6	(5.1)	18	9.8	(7.8)	20	.58	-.24
Family Resources (FRS)[&]	122.9	(22.5)	17	126.7	(19.9)	20	.60	.17
Family Adaptation (FACES)[+]								
Adaptability (range 16 to 33)	23.4	(5.3)	18	23.4	(5.1)	20	.99	.00
Cohesion (range 28 to 50)	42.7	(4.4)	18	40.9	(5.6)	20	.28	-.41
• Child Health[@]	2.1	(.7)	17	2.2	(.5)	20	.63	.14

[^] $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

Negative ES indicate the early intervention group is doing less well than the delayed intervention group.

[•] Scores based on a three-point rating (1 = low, 2 = average, 3 = high) completed by the intervenor most involved with the family. Infants and families in the Delayed Intervention group received no early intervention services from the SLC/IVH project prior to 18 months of age and therefore, Intervenor Ratings of Parents are not reported.

[$] Information about therapeutic services received by the child in addition to the regular early intervention program (e.g., home nursing, physical therapy, tutoring) was obtained via a parental questionnaire.

[+] Linear scoring (Olson, 1991)is used; higher scores are considered better.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[◆] Analyses for the FILE are based on raw scores. Lower scores are considered better.

[&] Analyses for the FRS are based on raw scores indicating number of resources indicated by the family as being available. Higher scores and positive ESs are considered better.

Interveners rated the parents annually on their support of, and involvement with, their child's program, and on their knowledge of their child's condition and program. The parent qualities were rated on a scale of 1-3, where 3 represented the most favorable rating. Mean scores ranged from 2.20 to 3.0, indicating that intervenors rated parents as having above average parent involvement qualities. At Reassessment #1, only the parents in the early intervention group were rated by the intervener. The mean scores of 2.2 and above indicate favorable ratings. At

Reassessments #2, #3, and #4, parents of children in the delayed intervention group were consistently rated more favorably by the intervener than were the early intervention group with five of the nine comparisons being statistically significant. These findings are puzzling. Possibly the parents in the delayed group were more involved in the intervention because they had "missed" the earlier opportunity. However, with the delayed intervention group reporting fewer intervention sessions with the project intervener at each reassessment (refer back to Table 5.6), this explanation seems doubtful. Another explanation might be that the interveners rated the parents they knew better more realistically than they did the parents they had less contact with. The intervener ratings were discontinued when the intervention service component of the project ended in September 1990.

Although the parents were rated somewhat differently by the interveners, over all the other contextual variables (including demographic variables, family functioning scores, and child health), the two groups appear to be fairly similar. Thus, the influence of these contextual variables on the outcome measures of child development and family functioning would appear to be comparable for both the early and the delayed intervention groups.

Cost of Alternative Interventions

The cost per child for the early intervention group (23 children) represents an accumulated cost of intervention from July 1986 to July 1988, the total program cost for two years and two phases of intervention as outlined under the intervention program description. The cost for services was from the date these 29 children turned 18 months of age and services began until 1988, the end of FY 1987-88. In Table 5.9, all cost estimates were adjusted for inflation to 1990 dollars.

Table 5.9

Cost Per Child for Two Years of Intervention (1986 - 1988) for the Salt Lake City Medically Fragile Age-at-Start Study (1990 dollars)

Resources	Early Intervention (n = 23)	Delayed Intervention (n = 29)
Agency Resources		
Direct service personnel	$ 2,101	$ 693
Administration		
program	395	127
university	126	40
Occupancy	250	78
Equipment	149	45
Transportation	49	19
Materials/supplies	60	30
SUBTOTAL	$ 3,130	$1,032
Contributed Resources		
Parent Time	2147	716
Parent Transportation	157	97
SUBTOTAL	$ 2,304	$ 813
Total	**$ 5,434**	**$1,845**

**Totals may not add up due to rounding errors.*

To arrive at the cost per child, total program costs were determined for each group and divided by the number of children in the group. As illustrated in Table 5.9, program costs included direct service and program and university administration, occupancy, equipment, transportation, and materials and supplies used for the respective groups.

Personnel costs included wages and benefits for the physical therapist, the developmental specialist, diagnosticians, a graduate assistant, and a secretary. Each of these were pro-rated according to actual time spent on intervention-related activities. Research costs in this, and all other resource categories, naturally, were excluded. Program administration included salaries and benefits for the percentage of FTE administrative personnel worked on the project. The university administrative cost applied to the small portion of the project that was operated out of Utah State University. For this, the university indirect rate for general, departmental, and sponsored projects administration was used (31.78%). Occupancy charges included rent paid for office space, utilities, maintenance, and insurance. Equipment costs included the cost of office furniture, computers, intervention toys and treatment equipment, and a supply of equipment available for loans to parents (seating devices, walkers, etc.). These costs were based on market replacement values for each item and annualized at a rate which accounted for interest and depreciation to determine the annual equipment cost. Agency transportation costs for home visits were calculated at $.21 per mile based on actual mileage.

Because the program relied heavily on parent participation for both intervention and, as the child got older, for transportation to the center, the opportunity cost of parent time was also determined. These costs were presented as "contributed resources" on Table 5.9. Parent time included time spent in (1) center and home visit sessions with either the physical therapist or the developmental specialist at one hour each; (2) intervention activities recommended by the program (20 minutes daily) for each parent and child at home; and (3) transportation time and expenses. Parents spent an average of 142 hours in Year One and 71 hours in Year Two in session with professionals and conducting intervention activities at home. Parent transportation costs in Year Two were gathered via telephone interview during which parents reported the number of trips taken to the center, the round-trip distance, and travel time. As reported in the economic section of the report, parent time was assigned the value of $9 per hour based on the average hourly earnings plus benefits for all working women in the U.S.

For children entering the program at 3 months CCA and receiving two years of individualized intervention from both professionals and their professionally trained parents the undiscounted cost of the program was $5,434 per child; for children entering the program later at 18 months, the cost was $1,845, including the value of parent time. The cost per child for two years of intervention is more than twice the cost for one year. This can be attributed to the emphasis on physical therapy in Year 1, which cost more than services from the developmental specialist. At 18 months, the program switched its emphasis for all children in the program from physical therapy to speech, self-help, social, and other age-appropriate skills.

Data Collection

Data were collected to determine the effects of intervention upon the child and the family. The assessment instruments were chosen to provide some consistency of data collection across sites, but also to provide information about children with intraventricular hemorrhage at birth and the unique experiences of their families. Additional assessments described in this section were administered as the subjects developed additional skills not present in younger children. Table 5.10 presents a schedule of assessment and reassessment measures as well as the ages at which they are administered. Table 5.11 provides a description of the measures.

Table 5.10

Schedule of Administration of Measures for Salt Lake City Medically Fragile Age-at-Start Study

	Assessment 3 month	6 month	12 month	Reassess. #1 18 month	Reassess. #2 30 month	Reassess. #3 42 month	Reassess. #4 54 month	Reassess. #5 66 month
CHILD MEASURES								
Battelle Developmental Inventory	X			X	X	X	X	X
Child Health				X	X	X	[illegible]	X
Binet Screening Test					X	X	X	X
Preschool Language Scale						X	X	
Draw-A-Person							X	X
Visual Motor Integration							X	X
Infant Temperament Questionnaire		X						
Toddler Temperament Questionnaire					X			
Carey Behavioral Style Checklist							X	
Child Behavior Checklist							X	X
Parent-Child Interaction Video			X		X	X	X	X
Motor Video			X					
Bruininks-Oseretsky								X
FAMILY MEASURES								
FSS	X			X	X	X	X	X
FRS	X			X	X	X	X	X
FACES	X			X	X	X	X	X
Demographics	X			X	X	X	X	X
FILE	X			X	X	X	X	X
PSI	X			X	X	X	X	X
Additional Services				X	X	X	X	X

Table 5.11

Description of Tests Administered for Salt Lake City Medically Fragile Age-at-Start Study

MEASURES	DESCRIPTION
CHILD MEASURES	
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Child Health (E.I.R.I.)	Assesses the parents' evaluation of the child's health during the past year, including general health, illnesses, hospitalization, etc.
Stanford-Binet Screening Test (Thorndike, Hagon, & Sattler, 1986)	Measures general intellectual ability for individuals from ages 2 to 18. One subtest is used from each of the following subtests: vocabulary, pattern analysis, quantitative, and bead memory.
Preschool Language Scale (PLS) (Zimmerman, Steiner, & Evatt, 1969)	Evaluates language strengths and deficits in the areas of auditory comprehension and verbal ability. It also assesses articulation and is designed for children ages 18-months to 7 years.
Draw A Person (D.A.P.)	The child is given a blank piece of 8" x 11" paper and asked to draw him (her) self. A raw score and age equivalent rating is determined by the number of body parts that are drawn and the proportion and detail of those parts.
Developmental Test of Visual-Motor Integration (V.M.I.) (Beery, 1989)	This measure includes a 24-item developmental sequence of geometric forms that is intended to identify early learning and behavioral problems. It is a paper and pencil test that can be administered individually or in groups.
Infant Temperament Scale (I.T.S.) (Carey & McDevitt, 1977)	This scale is a 95-item questionnaire that assesses the primary caregivers' estimate of the 4- to 8-month infant's temperament. Six aspects of temperament are each rated on a scale of 1 to 6, with high scores representing behavior more difficult to handle. Scoring categorizes infant behavior into easy, intermediate, slow-to-warm and difficult clusters.
Toddler Temperament Scale (TTS) (Fullard, McDevitt, & Carey, 1982)	This scale is a 99-item questionnaire completed by the primary caregiver. It is designed to assess the temperament or behavioral style in 1- to 3-year-old children. Scoring categorizes the toddler into easy, intermediate, slow-to-warm, and difficult clusters.
Behavioral Style Questionnaire (BSQ) (McDevitt & Carey, 1975)	This scale is a 100-item questionnaire completed by the primary caregiver. It assesses the temperament or behavioral style in 3- to 7-year-old children. Scoring categorizes the child into easy, intermediate, slow-to-warm, and difficult clusters.
The Child Behavior Checklist for Ages 4 to 5 (CBCL) (Achenback, 1986)	This test is designed to obtain standardized data on children's social competencies and internalizing and externalizing behavioral problems as reported by their parents.
Parent/Child Interaction (E.I.R.I.)	A 15- to 20-minute videotape of parent-child interaction following a set protocol devised by EIRI.
Videotaped Assessment of Motor Functioning (Peterson & Miller, 1985)	A videotaped procedure assessing quality of spontaneous motor development in 12-month-old infants.
The Bruininks-Oseretsky Test of Motor Proficiency (Bruininks, 1978)	This is an individually administered test of gross and fine motor functioning of children from 4-1/2 to 14-1/2 years of age. The test contains 46 items divided among eight subtests. Scores are obtained for an overall composite, gross motor and fine motor domains, and for each subtest.

(continued)

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Table 5.11 (continued)

MEASURES	DESCRIPTION
FAMILY MEASURES	
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Adaptability and Cohesion Evaluation Scale - III (FACES) Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: Intra-Family, Marital, Pregnancy and Childbearing, Finance and Business, Work-Family Transitions, Illness and Family "Care", Losses, Transitions "In and Out", and Legal.
Parenting Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related stress and stress in other aspects of parent's life (e.g., depression, isolation, health).
Additional Services (E.I.R.I.)	Provides data on services the child and family have received during the past year outside the study (e.g., schooling, early intervention, speech therapy, physical and occupational therapy, and tutoring).

Recruitment, training, and monitoring of diagnosticians. Rigorous certification procedures and requirements were implemented to ensure the qualifications and reliability of the diagnosticians administering assessments for the SLC/IVH study. Diagnosticians were required to independently become familiar with the BDI through study of the test manuals and viewing of a videotaped test administration. The diagnosticians then completed a 1½ day BDI administration training session conducted by a certified assessment trainer. During the training session, BDI testing procedures were explained, demonstrated, and practiced. Following the training session, diagnosticians completed three practice BDI administrations. The final practice administration was videotaped and then reviewed by the assessment coordinator. After the assessment coordinator verified that the diagnostician had correctly administered the test, the diagnostician began testing children for the study. Three diagnosticians completed the requirements to administer the initial assessment and reassessment measures. One diagnostician had a Ph.D. in psychology, and two were Ph.D. candidates in psychology. The Ph.D. candidates were recruited from Utah State University and the University of Utah Graduate Schools. Testing for later reassessments were done by diagnosticians with degrees in psychology and special education.

Infants were initially assessed by a child development specialist, who did not know the group assignment of the child. Different diagnosticians who had no involvement with the project or the interveners were chosen and trained to do the assessment and reassessments. In this way, it was ensured that diagnosticians were "blind" to the child's group assignment in the study.

To maintain records on the continued quality of the test results, shadow scoring of 10% of test administrations for each diagnostician was conducted by another trained diagnostician. Interrater reliability indicated that the diagnosticians are administering the tests with a reliability level above .90. Testing was scheduled directly with the diagnosticians by the site coordinator.

Initial assessment. The initial assessment was completed when the infants were at 3 months CCA (prematurity corrected to 40 weeks plus 3 months). The measures used are listed in Table 5.10. Parent measures indicated as being given at the initial assessment were not completed by all parents; the measures were introduced after the first subjects had already entered the study. All test and questionnaire protocols were sent to the EIRI site coordinator for scoring and placement in the EIRI file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the new-born.

Interim testing. When infants were 6 months CCA their parents were mailed the Carey Infant Temperament Scale to complete. This questionnaire was returned directly to the site coordinator via postpaid mail. Parents were paid $10 for completing the questionnaire.

Videotapes of parent-infant interaction and motor development were completed by a trained child development specialist or a licensed physical therapist when the infants were 12 months CCA. These videotaped sequences were rated by trained individuals who were "blind" to the study design and subject assignment to groups. Parents were paid a $10 incentive for videotaping. The parent-child interaction videotape involved the parent and child in play activities; a protocol used by all the EIRI sites was followed. In the first section, the mother and child played together for 15 minutes "as they would at home." Then for one minute the parent encouraged the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent left the room for 45 seconds. Taping continued for two minutes after the parent returned to the room.

The videotape of motor functioning followed a specific script. The motor script encouraged the child to perform the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

Reassessments. Infants were reassessed at 18 months corrected age and annually thereafter according to the schedule in Table 5.10. The measures are explained in Table 5.11. Appointments were made with the parents for the annual assessment. Most of the testing was completed in the children's homes, but a few were completed at mutually convenient places. In addition to the diagnostician who performed the child development assessments, at Reassessment #5, an occupational therapist performed the Bruininks-Oseretsky Test of Motor Proficiency. Parents were paid for each assessment (Reassessment #1, $20; Reassessment #2, $25; Reassessments #3 and #4, $35; and Reassessment #5, $40.)

By July 1, 1992, the 18-, 30-, and 42 month reassessments were completed; the 54-, 66-, and 78-month reassessments were partially completed; the 90-month reassessments had started. Table 5.12 reports the assessments to date.

Table 5.12

Testing Schedule for Salt Lake City Medically Fragile Age-at-Start Study

Time of Assessment	Number Assessed to Date
3 Months	58
18 Months	58
30 Months	57
42 Months	57
54 Months	49
66 Months	40
78 Months	20
90 Months	1

Results and Discussion

The purpose of the Salt Lake City Medically Fragile At-at-Start study was to compare the effectiveness of intervention begun early (at 3 months CCA) to intervention begun later (at 18 months CCA) for children with histories of perinatal intraventricular hemorrhage. The children were initially assessed when they were 3 months CCA, and reassessed at 18 months CCA, and yearly thereafter. The reassessment analyses reported here included all children who participated in the 18-, 30-, 42-, 54-, and 66-month reassessments.

Comparability of Groups on Initial Assessment Measures

As was noted in the section on initial family demographic comparisons, the families in the delayed and early intervention groups were very comparable (see Table 5.1). Few statistically significant differences were found between the groups. The differences included mother's age, father's education level, percent of fathers employed as technical/managerial or above, and percent of children who were

Caucasian. These differences indicated a slight advantage in favor of the early intervention group.

The maternal pregnancy characteristics were found to be very similar for the two groups (see Table 5.2). The child hospital characteristics were also comparable, with a slight advantage being in favor of the delayed intervention group.

At the adjusted age of 3 months, child functioning was measured with the Battelle Developmental Inventory (BDI). The BDI is a norm-referenced, standardized assessment of development in children from birth to 8 years of age and assesses five developmental domains: personal social, adaptive, motor (gross and fine), communication (receptive and expressive), and cognitive; a total developmental score is also provided. When their scores were compared, the groups were found to be similar in the personal/social, adaptive, and cognitive domains. However, statistically significant differences were found on the motor and communication domains (motor $\underline{p}$ = .01, ES = .61, communication $\underline{p}$ = .01, ES = .64) with the children in the early intervention scoring higher than the children in the delayed intervention group (see Table 5.13). Similar differences were found in the initial assessment BDI scores for those included in the 66-month testing (see Table 5.14).

Two issues from these findings are relevant to interpreting the outcome data. First, does the statistically significant differences reflect real functional differences? In administering the Battelle to 3-month-old infants, 6 or less items are used for each domain. Therefore, the difference in mean scores probably reflects the difference in completing one item. Second, how well do BDI developmental scores at 3 months of age predict later development? With a sample of 30 infants ranging in age of 5 months to 30 months, the correlations of the BDI with the Bayley Scales of Infant Development (Bayley, 1969) ranged from .27 to .95 (Boyd, Welge, Sexton, & Miller, 1989) indicating concurrent validity for the BDI scales. However, as Bayley (1970) herself states, there is often no correlation between the IQ scores measuring sensorimotor abilities attained by normal babies and their subsequent IQ scores. The

Table 5.13

Comparability of Initial Child and Family Measures for Salt Lake City Medically Fragile Age-at-Start Study

Variable	Delayed Intervention $\bar{x}$	(SD)	%ile	n	Early Intervention $\bar{x}$	(SD)	%ile	n	p Value	ES^
• Age at assessment (months)	3.4		(.7)		28	3.3	(.5)		·30 .46	-.14
• **Battelle Developmental* Inventory (BDI)**										
Personal/Social	17.9	(4.8)		28	19.1	(5.0)		30	.35	.25
Adaptive Behavior	13.1	(3.5)		28	14.1	(2.9)		30	.25	.29
Motor	12.3	(3.3)		28	14.3	(2.2)		30	.01	.61
Communication	9.3	(2.2)		28	10.7	(1.7)		30	.01	.64
Cognitive	6.5	(2.8)		28	7.3	(2.4)		30	.21	.29
TOTAL	59.0	(14.4)		28	65.6	(9.9)		30	.05	.46
• **Parenting Stress+ Index (PSI)**										
Child Related (range 47 to 235)	106.3	(21.4)	67	22	100.7	(19.7)	57	24	.36	.26
Other Related (range 54 to 270)	132.7	(29.8)	71	22	124.5	(19.2)	58	24	.27	.28
TOTAL (range 101 to 505)	239.0	(40.8)	70	22	225.0	(34.9)	56	24	.22	.34

^ $ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$

* Statistical analyses for BDI scores were conducted using raw scores for each of the scales.

+ Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores and positive ESs are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals. A low percentile score indicates low stress.

Table 5.14

Comparability of Assessment Child and Family Measures for Subjects included in 66-Month (Reassessment #4) Testing for Salt Lake City Medically Fragile Age-at-Start Study

	Delayed Intervention				Early Intervention					
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES^
• Battelle Developmental* Inventory (BDI)										
Personal/Social	16.8	(5.1)		19	18.9	(3.8)		21	.16	.41
Adaptive Behavior	12.6	(3.5)		19	13.8	(3.0)		21	.26	.34
Motor	12.1	(2.9)		19	14.1	(2.3)		21	.02	.69
Communication	9.1	(2.6)		19	11.1	(1.4)		21	.01	.77
Cognitive	6.7	(3.1)		19	7.9	(2.3)		21	.16	.39
TOTAL	57.3	(15.4)		19	65.8	(8.5)		21	.04	.55
• Parenting Stress+ Index										
Child Related (range 47 to 235)	106.5	(23.5)		14	98.9	(18.7)		15	.34	.32
Other Related (range 54 to 270)	129.8	(31.6)		14	126.4	(17.6)		15	.73	.11
TOTAL	236.3	(45.6)		14	225.3	(31.9)		15	.46	.24

^ $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

* Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the age equivalent (AGE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

+ Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores and positive ESs are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

same statement is probably true for infants born with physical disabilities or at risk for such disabilities. In comparing correlations of assessment and reassessment BDI scores in the present EIRI studies, much higher correlations between the initial assessment and Reassessment #1 were found for those who were of preschool age at the initial assessment (correlations ranging from .32 to .91) than for those in this study who were 3 months adjusted age at assessment. These correlations ranged from .04 to .49. Although the differences in mean assessment scores should be noted (the total BDI raw score was used as a covariate for the analyses of all subsequent reassessment developmental measures), the initial BDI difference between groups may not be as important as might be thought.

The Parenting Stress Index (Abidin, 1986) was completed by a parent in 46 of the families. The Parenting Stress Index provides two subscores, child-related stress and parent-related stress, and a total parenting stress score. With this reduced sample, significant differences were not found between the scores on parenting stress, but the percentiles and the effect sizes indicate that the parents in the early intervention group reported slightly less stress than did the parents in the delayed intervention group.

In summary, there are slight advantages in favor of the delayed intervention group on medical characteristics, and slight advantages for the early intervention group on family demographic characteristics, initial assessment of child development, (BDI), and parenting stress. When these differences are considered together, particularly in light of the number of tests of statistical significance that were performed, it appears that the groups were very comparable at assessment and that random fluctuation may at least partially account for the differences.

Effects of Early Versus Delayed Intervention on Measures of Child Functioning

Selection of covariates. Analysis of covariance procedures were used to measure differences between groups on measures of child and family functioning following early intervention services to one group of infants and delayed intervention to the other group. Treatment group served as the independent variable and the dependent variables were scores obtained from the assessment instruments described earlier. Analyses other than analysis of covariance procedures are described as such in the text and/or table. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All variables from the initial assessment were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or assessment variables for which there were the largest pretreatment differences. For example, number of days in NICU and assessment BDI Total raw score were used as covariates for 18-month personal/social raw scores. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $p \leq .10$ and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977) in those cases where a covariate or set of covariates could be found which correlated with the dependent variable in question (which was almost always the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 81% for finding moderate-sized differences (defined by Cohen as differences of a half-a-standard deviation.)

Table 5.15 reports results of ANCOVA comparisons for the child outcome measures of development, IQ, temperament, and language at 18, 30, 42, 54, and 66 months of

Table 5.15

Comparison of Reassessment Measures on Child Functioning for Children in Delayed and Early Groups in the Salt Lake Medically Fragile Age at Start Study

		Delayed Intervention				Early Intervention						
	Covariates$ In Order	X̄	(SD)	Adj.X̄#	n	X̄	(SD)	Adj.X̄#	n	ANCOVA F	p Value	ES^
18-MONTH TESTING (Reassessment #1)												
Age in Months at Reassessment #1♦		21.1	(1.3)		28	21.3	(.8)		28	.36	.55	.15
Battelle Developmental* Inventory (BDI)												
Raw scores for:												
Personal/Social	1,2	55.5	(12.2)	55.4	28	55.6	(15.2)	55.7	29	.01	.93	.02
Adaptive Behavior	1,2	40.6	(9.0)	40.9	28	41.1	(9.1)	40.9	29	.00	1.00	.00
Motor	1,2	59.8	(16.7)	60.7	28	61.4	(15.4)	60.4	29	.01	.94	-.02
Communication	1,2	28.7	(6.2)	29.2	28	29.1	(6.4)	28.6	29	.13	.72	-.10
Cognitive	1,2	22.1	(4.1)	22.4	28	21.9	(4.3)	21.6	29	.47	.49	-.20
TOTAL	1,2	206.7	(40.6)	208.6	28	209.1	(44.5)	207.3	29	.02	.90	-.03
30-MONTH TESTING (Reassessment #2)												
Age in months at Reassessment #2		32.9	(1.5)		28	33.0	(.9)		29	.15	.70	.07
Battelle Developmental* Inventory (BDI)												
Raw Scores for:												
Personal/Social	1,2	83.9	(20.5)	84.5	28	85.3	(23.9)	84.7	28	.00	.98	.01
Adaptive Behavior	1,2	54.5	(12.4)	54.9	28	56.6	(15.8)	56.2	28	.13	.72	.10
Motor	1,2	78.5	(18.0)	79.6	28	79.9	(19.5)	78.7	28	.04	.85	-.05
Communication	1,2	40.4	(9.1)	40.9	28	41.0	(10.3)	40.5	28	.02	.89	-.04
Cognitive	1,2	29.4	(7.4)	29.7	28	29.9	(7.7)	29.5	28	.01	.93	-.03
TOTAL	1,2	286.6	(58.9)	289.7	28	292.8	(69.5)	289.7	28	.00	1.00	.00
Stanford Binet IQ♠	1,2,3	99.5	(9.7)	98.6	26	99.2	(10.9)	100.1	24	.23	.63	.15
42-MONTH TESTING (Reassessment #3)												
Age in Months at Reassessment #3♦		42.6	(.5)		28	42.7	(1.0)		29	.12	.73	.20
Battelle Developmental* Inventory (BDI)												
Raw Scores for:												
Personal/Social	1,2	101.0	(22.9)	101.3	28	104.1	(26.7)	103.8	28	.13	.73	.11
Adaptive Behavior	1,2	67.5	(14.1)	67.8	28	71.0	(12.0)	70.7	28	.65	.42	.21
Motor	1,2	90.5	(21.0)	90.9	28	93.3	(15.5)	93.0	28	.16	.69	.11
Communication	1,2	53.8	(16.6)	53.9	28	58.4	(12.4)	58.3	28	1.14	.29	.27
Cognitive	1,2	39.3	(10.5)	39.3	28	43.7	(9.4)	43.7	28	2.40	.13	.42
TOTAL	1,2	352.2	(76.8)	352.9	28	373.6	(57.5)	372.9	28	1.10	.29	.26
Stanford Binet Composite IQ♠	1,2,3	95.0	(12.7)	94.2	26	90.3	(21.4)	91.1	27	.39	.53	-.24
Preschool Language Scale♠												
Auditory Comprehension	3,5	101.5	(17.9)	102.9	26	104.1	(19.7)	102.8	28	.00	.99	.00
Verbal Abilities	3,5	95.5	(21.7)	98.3	26	98.3	(21.8)	95.6	28	.18	.67	-.12
Language Quotient	3,5	98.7	(18.6)	100.5	26	99.5	(20.3)	97.7	28	.24	.63	-.15

(continued)

^ $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$ Negative ES indicates that the early intervention group is doing less well than the delayed intervention group.

♦ Child age is coded in actual months of age and is not adjusted for prematurity.

* Statistical analyses for the BDI was conducted using raw scores and these are presented in the table.

Covariance adjusted means.

♠ Stanford Binet screening provided a composite IQ score.

$ 1 = Battelle Developmental Total Raw Score at Assessment, 2 = Days of care in NICU, 3 = Education of father, 5 = BDI expressive communication raw score.

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Table 5.15 (continued)

Comparison of Reassessment Measures on Child Functioning for Children in Delayed and Early Groups in the Salt Lake Medically Fragile Age-at-Start Study

	Covariates$ In Order	Delayed Intervention				Early Intervention				ANCOVA F	P Value	ES^
		X̄	(SD)	Adj. X̄	n	X̄	(SD)	Adj. X̄	n			
54-MONTH TESTING (Reassessment #4)												
Age in Months at Reassessment #4♦		54.3	(.7)		26	54.4	(.8)		23	.15	.70	-.14
Battelle Developmental* Inventory (BDI) Raw Scores for:												
Personal/Social	1,2	114.2	(30.7)	114.9	26	117.0	(22.0)	116.3	22	.03	.86	.05
Adaptive Behavior	1,2	75.8	(18.6)	75.4	26	78.5	(12.7)	78.9	22	.53	.47	.19
Motor	1,2	101.3	(28.0)	102.2	26	105.6	(22.2)	104.7	22	.11	.75	.12
Communication	1,2	64.6	(18.8)	64.7	26	70.6	(15.3)	70.5	22	1.38	.25	.31
Cognitive	1,2	50.2	(15.6)	50.3	26	55.9	(13.6)	55.8	22	1.60	.21	.35
TOTAL	1,2	406.3	(103.4)	407.7	26	427.6	(73.9)	426.1	22	.49	.49	.18
Stanford Binet												
Composite IQ♠	1,2,3	91.4	(15.7)	90.9	24	91.8	(14.4)	92.2	21	.08	.78	.08
Preschool Language Scale^												
Auditory Comp.	3,5	102.6	(16.4)	105.4	24	100.7	(23.4)	97.9	23	1.48	.23	-.46
Verbal Abil.	3,5	94.5	(18.9)	97.8	24	102.3	(22.7)	99.0	23	.03	.86	.06
Language Quotient	3,5	98.7	(16.8)	101.2	24	97.3	(26.5)	94.8	23	1.02	.32	-.38
Child Behavior Checklist												
Internalizing Score		11.4	(8.2)		24	11.5	(10.0)		22	.00	.95	.01
Externalizing Score		11.9	(10.2)		24	9.7	(9.2)		22	.60	.44	-.22
Sum of Social Comp.	1,2,4	10.1	(4.8)	10.4	25	11.9	(3.7)	11.5	21	.77	.39	.23
Developmental Test of Visual Motor Integration (VMI)												
VMI Raw Scores	2,4	4.9	(2.3)	4.9	23	4.5	(2.0)	4.5	21	.40	.53	-.17
66-MONTH TESTING (Reassessment #5)♦												
Age in Months at Reassessment #5		67.2	(2.9)		17	65.9	(2.0)		19		.11	-.45
Battelle Developmental* Inventory (BDI) Raw Scores for:												
Personal/Social	1,2	138.1	(29.5)	137.6	19	144.0	(20.2)	144.4	20	.71	.41	.06
Adaptive Behavior	1,2	87.1	(20.7)	86.3	19	93.6	(13.5)	94.4	20	2.10	.16	.31
Motor	1,2	123.3	(31.8)	121.7	19	129.5	(21.3)	131.0	20	1.15	.29	.19
Communication	1,2	81.3	(21.8)	80.8	19	85.6	(15.4)	86.0	20	.80	.38	.20
Cognitive	1,2	75.5	(21.7)	74.2	19	77.2	(16.3)	77.2	20	.55	.46	.08
TOTAL	1,2	502.0	(118.4)	497.1	19	530.0	(76.1)	534.9	20	1.52	.23	.24
Stanford-Binet♠												
Composite IQ	1,2,3	94.2	(10.0)	94.2	18	95.1	(14.0)	95.1	18	.05	.82	.09
Child Behavior Checklist (CBCL)♦												
Internalizing Score		12.3	(9.2)		18	9.6	(6.0)		21	1.22	.28	.29
Externalizing Score		10.9	(7.1)		18	8.3	(6.3)		21	1.54	.22	.37
Sum of Social Comp.	1,2,4	12.2	(5.7)	12.2	18	11.8	(3.5)	11.8	20	.06	.81	-.07
Developmental Test of Visual Motor Integration (VMI)												
VMI Raw Scores	2,4	7.5	(2.5)	7.4	17	7.2	(2.6)	7.3	20	.01	.91	-.12

^ $\text{ES} = \dfrac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$ Negative ES indicate that the early intervention group is doing less well than the delayed intervention group.

♦ Child age is coded in actual months of age and is not adjusted for prematurity.

* Statistical analyses for the BDI was conducted using raw scores and these are presented in the table.

# Covariance adjusted means.

♠ Stanford Binet screening provided a composite IQ score.

♦ On the CBCL, lower internalizing and externalizing scores as well as higher sum of social competence scores are considered to be better.

$ 1 = Battelle Developmental Total Raw Score at Assessment, 2 = Days of care in NICU, 3 = Education of father, 4 = Annual Income, 5 = Battelle expressive communication raw score

age. Child development was measured primarily by the Battelle Developmental Inventory across Reassessments #1 to #5. All the raw score comparisons, except cognitive development at Reassessment #1, favor the early intervention group. When

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the scores are adjusted with the covariates (days in NICU and initial BDI total raw score), the comparisons at Reassessments #3, #4, and #5 (but not those at the first two reassessments) favor the early intervention group. However, at no time were any of the differences in scores statistically significantly different. The children in both groups appear to be developing comparably.

The Stanford Binet Screening Test was used to measure the children's intelligence on second through fifth reassessments. From 3 to 5 children at each reassessment were too developmentally delayed to complete this assessment. The comparisons at all the reassessments demonstrate again that the children in the two groups are developing similarly.

A measure of language development, the Preschool Language Scale, was completed by the children at the ages of 42 and 54 months (Reassessments #3 and #4). Auditory comprehension and verbal ability raw scores are reported as well as a language quotient in Table 5.15. These scores provide an additional measure of communicative development to those provided by the BDI. Correlations of these scores with the BDI communication raw score range from .53 to .72 at Reassessment #3, and from .79 to .88 at Reassessment #4. The comparability in language development of the two groups is again confirmed by the lack of statistically significant differences at either reassessment.

The VMI, a measure of visual motor integration, was completed by the children at the fourth and fifth reassessments. This measure of visual motor integration was developed to identify early learning problems. The VMI total raw score correlates most highly with fine motor raw score of the BDI scores (Reassessment #4; r = .83; Reassessment #5, r = .71). At both reassessments, the mean score for the delayed intervention group are slightly higher (better) than for the early intervention group, but the differences are not statistically significantly different. On this measure also, the groups appear to be developing comparably.

The Bruininks-Oseretsky Test of Motor Proficiency (B & O), an extensive measure of gross and fine motor functioning was scheduled to be administered to all the subjects as part of the 66-month assessment. The assessment, given by a licensed physical or occupational therapist, required approximately two hours to complete and cost approximately $80 per subject. Sixteen subjects were assessed with the B & O. T-test comparisons between the groups (n = 8 + 8) showed no statistically significant group differences. Because the correlations of the B & O fine motor, gross motor, and total score with the fine motor, gross motor, and total motor scores were very high (range of r = .73 to .83), it appeared that this costly assessment was not adding any new information. Therefore, its use was discontinued.

In sum, the two groups scored remarkably similarly on all of the child outcome measures. No statistically significant differences were found out of over 50 comparisons across reassessments. The two groups appear to be developing very comparably on development, IQ, language, and social adjustment.

However, within this sample of infants who experienced IVH at birth, there is great diversity in development. Battelle developmental quotients (age equivalent scores ÷ chronological age x 100) vary from approximately 10 to 110. The median developmental quotients for Reassessments #1 through #5 ranged from 82 to 89. Approximately 22% of the children have delays of 30 points, or two standard deviations below the mean. The Stanford Binet Screening scores at Reassessment #2, #3, and #4 indicate slightly higher abilities with the scores ranging from approximately 80 to 120; but, as was stated previously, the children who are the most seriously impaired were not able to complete this assessment.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Measures of parent interactional behaviors, parenting stress, and social support were taken at the annual reassessments. Most of the analyses were done without covariates because the number of parents who completed the PSI or the FSS at the initial assessment was limited, and the initial assessment score could not be used as a covariate because too many cases would be lost in the analyses. Other demographic characteristics did not correlate highly enough with the reassessment PSI or FSS scores to be used as covariates. Theoretically, the intervention delivered by the physical therapist or the home visitor might have influenced the way the mother interacted with the child. It is also generally accepted that parent behaviors influence child outcomes. For these two reasons, parent-child interaction behaviors were observed and videotaped. Parent-child interaction videotapes were collected for 33 of the children when the children were 12 months of age and 44 were collected when they were 30 months of age.

The 12-month videotapes were coded with the Parent/Caregiver Involvement Scale (PCIS; Farran et al., 1986) and the 30-month videotapes were coded with the Parent Behavior Rating Scale (PBRS) (Mahoney, 1988). The coding for both scales was under the direction of their respective authors.

Both the PCIS and PBRS rate the parents' interaction behaviors. The PCIS (Farran et al., 1986) scale measures 11 aspects of parent or caregiver behaviors. These scales include: physical involvement, verbal involvement, responsiveness, play interaction, teaching behavior, control, directives, relationship among activities in which caregiver was involved, positive statements, negative statements/discipline, and goal setting. Each of these caregiver behaviors were rated separately for amount of behavior, quality of behavior, and appropriateness of behavior on 5-point Likert-type scales. The amount scores for the 11 variables were summed and averaged resulting in an amount score. Similarly, quality and appropriateness of behaviors were summed and averaged.

The PBRS (Mahoney, 1988) rates 12 aspects of parental behaviors including warmth, expressiveness, enjoyment, acceptance, sensitivity to child's interest, responsivity, effectiveness, directiveness, achievement orientation, pace, inventiveness, and verbal praise. Based on a maximum likelihood factor analysis with oblique rotation (using the SPSSPC procedures) of these 12 variables for 237 observations of parent-child interaction from the EIRI studies, 3 factors were identified which together accounted for 59.6% of the variance. Factor 1, Affective Relationship with Child, included expressiveness toward child, warmth, enjoyment of interacting with child, inventiveness in play, and acceptance of child's behaviors. For Factor 2, Orientation to Child's Interests/Responsivity, sensitivity to child's interests, responsivity, inventiveness in play, and effectiveness of parent to engage child in play interaction were summed, and directiveness (frequency and intensity of directives) was subtracted. Factor 3, Performance Orientation, included achievement orientation, pace of parent's behaviors, verbal praise, and intensity and frequency of directiveness.

The two groups appear very similar at the 12- and 30-month assessments (see Table 5.16.) No statistical differences are seen in the parent behaviors as coded by either system. The 12-month assessment provides a comparison of between mothers who were participating in intervention with the physical therapist and those who were not; while at the 30-month assessment, all mothers were receiving the home visits with the CAMS program. A difference at the 12-month assessment would possibly be more expected than at the 30-month assessment because only the one group of mothers was involved in the intervention at that time. Also, since parent interaction behaviors are linked with child development outcomes (Ainsworth et al., 1978; Belsky & Isabella, 1988), these ratings will be possibly used in future analyses as independent variables or as covariates.

Although the intervention was not specifically focused at the parent's perceptions of social support or parenting stress, it seems possible that by providing sensory motor intervention with the parent watching, and particularly after 18 months of age, by visiting the home to monitor and discuss child progress and suggest activities, the mother's parenting stress might decrease and her perception

Table 5.16

Comparison of Reassessment Measures of Family Functioning of Delayed Intervention and Early Intervention groups in the Salt Lake Medically Fragile Age-at-Start Study

Variable	Covariates[$]	Delayed Intervention					Early Intervention					ANCOVA		
		$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	%ile	n	F	p Value	ES[^]
12-MONTH ASSESSMENT														
• Parent Caregiver Interaction Scale (Farran)														
Average Rating:														
Amount	3	2.7	(.7)	2.7		17	2.7	(.5)	2.8		17	.09	.76	.14
Quality	0,2	3.8	(.7)	3.8		17	3.8	(.7)	3.7		16	.18	.67	-.14
Appropriateness	2	3.7	(.6)	3.7		17	3.6	(.6)	3.6		16	.31	.58	-.17
18-MONTH TESTING (Reassessment #1)														
• **Parent Stress Index**[♦]														
Child Related (range 47 - 235)		102.3	(13.3)		61	28	100.5	(15.6)		57	29	.35	.56	.14
Other (range 54 - 270)	0,1	129.1	(29.8)	128.4	63	28	121.2	(22.8)	121.9	52	29	.99	.33	.22
• **Family Support Scale**[&] (FSS)		29.3	(7.2)		56	28	31.6	(13.1)		66	27	.67	.42	.32
30-MONTH TESTING (Reassessment #2)														
• **Parent Stress Index**[♦]														
Child Related (range 47 to 235)		102.3	(16.8)		60	27	100.2	(20.4)		55	29	.17	.68	.12
Other (range 54 to 270)		129.0	(22.8)		65	27	119.5	(24.2)		48	29	2.29	.14	.42
• **Family Support Scale**[&] (FSS)		29.4	(10.1)		57	27	31.4	(11.2)		64	29	.46	.50	.19
• **Parent Behavior Rating Scale (Mahoney)**														
Affective relationship	4	3.3	(.7)	3.2		26	3.1	(.7)	3.2		25	.07	.79	.00
Child Orientation	2	3.5	(.4)	3.5		26	3.4	(.7)	3.4		24	.29	.59	-.25
Performance Orientation	3	3.2	(.6)	3.2		26	3.2	(.7)	3.2		24	.01	.94	.00
42-MONTH TESTING (Reassessment #3)														
• **Parent Stress Index**[♦]														
Child Related (range 47 to 235)		104.9	(18.9)		65	27	102.2	(16.3)		60	28	.32	.57	.14
Other (range 54 to 270)		125.8	(24.9)		60	27	127.3	(25.4)		61	28	.05	83	-.04
• **Family Support Scale**[&] (FSS)		29.0	(10.6)		55	27	31.0	(10.5)		63	28	.51	.48	.19
54-MONTH TESTING (Reassessment #4)														
• **Parent Stress Index**[♦]														
Child Related (range 47 to 235)		110.2	(23.3)		75	25	100.6	(20.9)		57	21	2.13	.15	.41
Other (range 54 to 270)		128.1	(21.0)		63	25	123.3	(27.9)		55	21	.43	.51	.05
• **Family Support Scale**[&] (FSS)		30.8	(11.0)		63	25	30.7	(9.5)		63	22	.00	.98	.01

(continued)

[^] $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$

Negative ES indicate that the early intervention group is doing less well than the delayed intervention group.

[#] Covariance adjusted means

[&] Analyses for the FSS is based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all assessments collected as a part of the Longitudinal Studies (currently, 854 families with children with disabilities).

[♦] Analysis for the PSI are based on raw scores. Lower scores are considered better. Both scales provide norms. High percentiles on the PSI represent more stress.

[$] 0 = total income; 1 = Mother's hours of work outside of home; 2 = Days of care in NICU; 3 = Grade of IVH; 4 = Battelle Total Raw

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Table 5.16 (continued)

Comparison of Reassessment Measures of Family Functioning of Delayed Intervention and Early Intervention groups in the Salt Lake Medically Fragile Age-at-Start Study

Variable	Covariates[$]	Delayed Intervention					Early Intervention					ANCOVA F	p Value	ES[^]
		$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	%ile	n			
66-MONTH TESTING (Reassessment #5)														
• **Parent Stress Index**[♦]														
Child Related (range 47 to 235)		102.7	(17.1)		61	18	101.1	(20.8)		57	20	.07	.80	.09
Other (range 54 to 270)		118.8	(23.4)		46	18	125.0	(18.5)		58	20	.82	.37	-.26
• **Family Support Scale**[&] (FSS)		30.8	(8.8)		63	18	26.6	(9.1)		48	19	2.03	.16	-.48

[^] $$ES = \frac{\text{Early Intervention } \bar{x} - \text{Delayed Intervention } \bar{x}}{\text{Delayed Intervention SD}}$$ Negative ES indicate that the early intervention group is doing less well than the delayed intervention group.

[#] Covariance adjusted means

[&] Analyses for the FSS is based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all assessments collected as a part of the Longitudinal Studies (currently, 854 families with children with disabilities).

[♦] Analysis for the PSI are based on raw scores. Lower scores are considered better. Both scales provide norms. High percentiles on the PSI represent more stress.

of social support might increase. The Family Support Scale (FSS) measures support from professionals as well as from family members, neighbors, and others. The Parenting Stress Index (PSI) provides a measure of stress due to child characteristics and stress in other relationships due to parenting. Results of the ANCOVA did not support this prediction; no significant differences between the early and delayed intervention groups on family support or parenting stress were found at any of the reassessments (see Table 5.16).

In sum, no statistically significant differences on parent measures were found. However, the parents in the early intervention group consistently, across reassessments, reported somewhat less parenting stress than did the parents in the delayed intervention group as the percentile scores and effect sizes on Table 5.16 indicate (except for other related stress at Reassessment #3), but the stress felt by both groups was well within the normal range. They also reported slightly more social support, as indicated by the positive effect size signs and percentiles.

Other Analyses

Videotaped assessment of motor functioning. A videotaped procedure was used to capture spontaneous motor behavior in 12-month-old infants. This sequence encourages the infant to perform a series of 13 movement patterns which are typically attained during the first year of life. Included in the movement patterns elicited are rolling over, crawling, sitting up, pulling to stand, cruising, walking, squatting, and reaching, among others. The infant's performance was rated using a three-point rating scale which assesses qualities of movement patterns such as weight shift, balance, coordination, reflex integration, body alignment, symmetry, and trunk rotation.

Twenty-seven infants were assessed with the Videotaped Assessment of Motor Functioning at 12 months corrected ages. These were rated using the Motor Sequence Rating Scale (Peterson & Miller, 1985). The total score of the motor rating was correlated with the fine motor, gross motor, motor total, and cognitive subdomain scores from the reassessments at 18 and 30 months, CCA. All the correlations are statistically significantly high, especially for the gross motor correlation (see Table 5.17).

Table 5.17

Correlations of Battelle Developmental Inventory Raw Scores with Videotaped Motor Ratings at 18 and 30 Months Corrected Chronological Age for the Salt Lake City Medically Fragile Age-at-Start Study

	18 Month CCA			30 Month CCA		
Variable	r	p	n	r	p	n
Fine Motor	.69	.00	27	.71	.00	24
Gross Motor	.89	.00	27	.91	.00	24
Motor Total	.85	.00	27	.87	.00	24
Cognitive	.59	.00	27	.63	.00	24
TOTAL	.63	.00	27	.70	.00	24

Because this assessment was being developed, not all the videotapes were adequate to be scored with the rating system. Twenty-seven of the tapes were usable and these did not happen to be equally divided between the early and delayed intervention groups. Therefore, the motor functioning of the early intervention and the delayed intervention groups was not compared.

Birth characteristics as predictors of child development outcome. Within the research field concerned with the effectiveness of early intervention for medically fragile infants, there remains an overwhelming need for earlier and more accurate predictors of developmental outcomes (Bennett, 1987). Casto (1992) developed the Medical Status Index (MSI) in which certain neonatal risk factors and birth characteristics are rated as to their severity on a 1-3-5 point scale. The factors rated included days on ventilator, respiratory status, days hospitalized, neurological status, sensory status, birthweight, and medical complications. The possible range of the total scores was 7 to 35, with higher scores indicating more severe conditions. The mean score for this sample was 17.41, with a range of 7.7 to 33. A median split analysis was performed with a t-test procedure, and the group (n = 27) with the less severe medical index scores scored statistically significantly better (p = .04) than did the group (n = 31) with the more severe index scores on the BDI at Reassessment #1.

Correlational analyses were performed investigating the relationships of the seven-item and total scores of the MSI and other measures of birth and neonatal risk with the child developmental outcomes at the 66-month assessment. The purpose was to investigate which of these measures of birth characteristics and neonatal risk factors best predicted child development 5½ years later. The three variables with the highest overall correlations were (a) number of days spent in the Neonatal Intensive Care Unit (NICU), (b) the degree of sensory impairment as measured by that item in the MSI, and (c) the degree of neurological damage (also measured by MSI) (refer to Table 5.17). The total score of the MSI also correlated statistically significantly with the child development scores, but not as highly. These variables were much more salient than variables that are more often used in research and practice (e.g., birthweight, gestational age, and APGAR scores).

Intervention intensity comparison. Perhaps the group comparison (early vs delayed intervention groups) did not provide an adequate test of the difference in beginning intervention at three versus 18 months, given that all of the children in the early intervention group did not receive the prescribed frequency of intervention. Hence it seemed appropriate to compare a group who had received the desired frequency of early intervention with a group who received the later intervention. Eighteen children who were in the early intervention group, had received 11 or more intervention sessions between the ages of 3 and 10 months, and lived in the greater Salt Lake City area during the 3 to 18 month period, were identified. Sixteen children in the delayed group who also had stayed in the greater Salt Lake City area for that time period were identified. T-test analyses of these two groups on family demographic and child birth characteristics were completed to see if the two groups were initially comparable. The two groups were found to be comparable on all the demographic characteristics, but they differed substantially on certain birth characteristics. The characteristics that the two groups differed on included birthweight ($p = .01$), gestational age ($p = .02$), number of transfusions ($p = .04$), Medical Status Index total score ($p = .03$), and number of days in intensive care (NICU) ($p = .01$) with the children in the comparison group having the advantage. The number of covariates used in the analysis was limited to one (days in NICU) because of the small sample size. At reassessments #1 and #2 there were no statistically significant differences on measures of child development, family support, or parenting stress between the groups who had received the recommended amount of early intervention and the delayed intervention group. However, at Reassessments #3 and #4 the early intervention group scored significantly higher on total BDI and three subdomains (adaptive behavior, communication, and cognitive) than did the delayed intervention group (refer to Table 5.18). At Reassessment #4,

Table 5.17

Bivariate Correlations, Means, and Standard Deviations of Developmental Outcome at 66 Months and Birth Data

	BDI Raw Scores							
Birth Data	Personal/ Social	Adaption Behavior	Motor	Communication	Cognitive	Total	$\bar{x}$	SD
1. Days in NICU	$-.43^{**}$	$-.41^{**}$	$-.43^{**}$	$-.46^{**}$	$-.55^{***}$	$-.47^{**}$	31	31
2. Birthweight	.19	.22	.25	.18	.19	.20	1410	620
3. Grade of IVH	-.19	$-.28^{*}$	$-.48^{**}$	-.22	$-.34^{*}$	$-.33^{*}$	2.2	1.1
4. Days on ventilator	$-.28^{*}$	$-.26^{*}$	$-.30^{*}$	$-.30^{*}$	$-.39^{**}$	$-.31^{*}$	2.3	1.9
5. Days hospitalized	$-.28^{*}$	$-.28^{*}$	-.24	$-.30^{*}$	$-.34^{*}$	$-.29^{*}$	3.5	1.5
6. Neurological status[a]	$-.29^{*}$	$-.41^{**}$	$-.59^{***}$	$-.33^{*}$	$-.44^{**}$	$-.44^{**}$	2.0	1.5
7. Sensory status[b]	$-.51^{***}$	$-.50^{***}$	$-.38^{**}$	$-.44^{**}$	$-.41^{**}$	$-.48^{***}$	1.3	.8
8. Category of weight	$-.31^{*}$	$-.31^{*}$	$-.32^{*}$	$-.27^{*}$	$-.29^{*}$	$-.31^{*}$	2.9	1.5
9. Medical Status Total[c]	$-.33^{*}$	$-.34^{**}$	$-.40^{**}$	$-.34^{*}$	$-.40^{**}$	$-.38^{**}$	17.4	7.7
10. Number of transfusions	-.26	-.21	$-.28^{*}$	$-.28^{*}$	$-.40^{**}$	$-.30^{*}$	9.4	9.2
11. 5-minute APGAR	.02	.15	$.33^{*}$	.11	.20	.20	6.1	1.8
12. Gestational age	.24	$.27^{*}$	.26	.19	.19	.24	30	3.2
13. Respiratory Distress	$-.34^{*}$	$-.35^{*}$	$-.42^{**}$	$-.36^{*}$	$-.44^{**}$	$-.41^{**}$	.1	.3
14. Seizure Disorder	$-.39^{**}$	$-.37^{**}$	$-.29^{*}$	$-.38^{**}$	$-.30^{*}$	$-.36^{*}$	.1	.3
15. Lumbar puncture	-.23	-.23	-.24	-.27	$-.29^{*}$	-.26	.4	.5
$\bar{x}$	141.3	90.7	126.7	83.7	76.6	517.5		
SD	24.7	17.3	26.4	18.5	18.7	97.7		

$^{*}\ p \le 0.05$; $^{**}\ p \le 0.01$; $^{***}\ p \le 0.001$

Note:
[a] Degree of neurological damage, as indicated by neuro exam and grade of IVH.
[b] Stage of ROP and degree of hearing defect.
[c] Total score on the Medical Status Index (MSI; Casto, 1992).
$\bar{x}$ = mean.
SD = Standard Deviation

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Table 5.18

Comparison of Measures on Child and Family Functioning for Children Receiving 11 or More Intervention Sessions During Early Intervention Period and Children in Delayed Group*

Variables	Covariates&	Delayed Intervention $\bar{X}$	Delayed Intervention (SD)	Delayed Intervention Adj. $\bar{X}$	Delayed Intervention n	Early Intervention $\bar{X}$	Early Intervention (SD)	Early Intervention Adj. $\bar{X}$	Early Intervention n	ANCOVA F	p Value	ES^
18-MONTH REASSESSMENT												
Battelle Developmental Inventory (BDI)												
Raw scores for:												
Personal/Social	1	57.7	(13.9)	54.5	16	53.8	(15.5)	57.0	18	.25	.62	.18
Adaptive behavior	1	40.8	(7.1)	38.9	16	40.3	(11.0)	42.2	18	1.05	.31	.46
Motor	1	59.3	(15.8)	56.2	16	58.7	(18.4)	61.9	18	.88	.36	.36
Communication	1	30.8	(4.4)	29.3	16	27.8	(7.5)	29.2	18	.00	.96	-.02
Cognitive	1	21.9	(3.1)	21.0	16	21.3	(5.0)	22.2	18	.66	.42	.39
TOTAL	1	210.5	(35.2)	200.0	16	202.0	(52.1)	212.5	18	.72	.40	.36
PARENTING STRESS INDEX (PSI)												
Child Related (range 47 to 235)	1	105.8	(14.2)	106.2	16	103.8	(11.6)	103.3	17	.34	.57	.20
Other (range 54 TO 270)	1	128.0	(34.2)	126.6	16	123.3	(17.0)	124.6	17	.04	.85	.06
FAMILY SUPPORT SCALE (FSS)	1	29.1	(7.1)	29.8	16	34.5	(11.0)	33.7	15	1.18	.29	.55
30-MONTH REASSESSMENT												
Battelle Developmental Inventory (BDI)												
Raw scores for:												
Personal/Social	1	83.9	(18.5)	80.8	16	84.7	(28.1)	87.8	18	.63	.44	.38
Adaptive Behavior	1	55.0	(9.6)	52.4	16	55.6	(18.2)	58.2	18	1.23	.28	.60
Motor	1	79.2	(16.1)	76.1	16	77.7	(21.8)	80.8	18	.46	.51	.29
Communication	1	40.8	(7.9)	39.2	16	39.7	(11.6)	41.3	18	.35	.56	.27
Cognitive	1	30.8	(6.3)	29.4	16	28.9	(8.4)	30.3	18	.11	.74	.14
Total	1	289.7	(46.2)	277.9	16	286.6	(81.6)	298.4	18	.74	.40	.44
Parenting Stress Index												
Child Related	1	104.9	(18.6)	106.4	16	104.8	(20.2)	103.3	18	.18	.68	.17
Other	1	127.3	(24.1)	126.2	16	122.3	(22.5)	123.4	18	.10	.76	.12
Family Support Scale (FSS)	1	30.3	(10.5)	31.7	16	33.7	(9.7)	32.2	18	..01	.91	.05
42-MONTH REASSESSMENT												
Battelle Developmental Inventory (BDI)												
Raw Scores for:												
Personal/Social	1	103.9	(22.8)	102.1	16	102.0	(31.1)	103.8	17	.03	.87	.07
Adaptive Behavior	1	67.5	(13.9)	65.4	16	71.7	(12.5)	73.8	17	3.19	.08	.60
Motor	1	90.2	(19.9)	88.4	16	92.4	(15.5)	94.3	17	.81	.38	.30
Communication	1	54.3	(16..6)	51.8	16	57.6	(10.8)	60.1	17	2.95	.10	.50
Cognitive	1	40.6	(9.6)	39.1	16	43.7	(7.4)	45.2	17	4.09	.05	.64
Total	1	356.6	(70.1)	345.7	16	372.7	(53.9)	383.5	17	2.98	.10	.54
Parenting Stress Index (PSI)												
Child Related	1	106.5	(17.1)	107.5	15	102.2	(14.6)	101.2	17	1.05	.31	.37
Other	1	130.1	(27.4)	129.2	15	126.6	(27.5)	127.5	17	.03	.87	.06
Family Support Scale (FSS)	1	29.0	(12.8)	29.6	15	33.6	(8.7)	33.0	17	.65	.43	.27

(continued)

* This group contains only those children in the delayed group who remained in the same geographical area for the 18-month time period.

# Covariance adjusted means.

& Covariates: 1 = Days of care in NICU

^ $$ES = \frac{\text{Early Intervention with 11 or more adj. } \bar{x} - \text{Delayed Intervention adj. } \bar{x}}{\text{Delayed Intervention SD}}$$

Negative ES indicates that the early intervention group is doing less well than the delayed intervention group.

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Table 5.18

Comparison of Measures on Child and Family Functioning for Children Receiving 11 or More Intervention Sessions During Early Intervention Period and Children in Delayed Group*

		Delayed Intervention				Early Intervention						
Variables	Covariates&	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	ANCOVA F	p Value	ES^
54-MONTH REASSESSMENT												
Battelle Developmental Inventory (BDI)												
Raw scores for:												
Personal/Social	1	114.1	(28.6)	109.0	15	117.9	(23.2)	123.0	14	2.09	.16	.49
Adaptive Behavior	1	75.1	(16.8)	71.8	15	78.6	(14.3)	82.0	14	3.36	.08	.61
Motor	1	100.4	(27.3)	97.0	15	106.1	(20.2)	109.6	14	1.77	.20	.46
Communication	1	65.9	(19.1)	61.0	15	72.4	(15.7)	77.3	14	8.67	.01	.85
Cognitive	1	51.5	(15.2)	47.9	15	54.7	(13.0)	58.3	14	4.88	.04	.68
Total	1	407.3	(96.2)	387.0	15	429.7	(71.4)	450.1	14	4.67	.04	.66
Parenting Stress Index (PSI)												
Child Related	1	111.1	(27.3)	115.3	14	101.6	(20.2)	97.4	14	3.80	.06	.66
Other	1	127.9	(24.5)	127.5	14	122.4	(22.9)	122.8	14	.23	.64	.19
Family Support Scale (FSS)	1	27.4	(8.2)	27.7	14	33.6	(9.5)	33.3	14	2.25	.15	.68
66-MONTH REASSESSMENT												
Battelle Developmental Inventory (BDI)												
Raw Scores for:												
Personal/Social	1	146.3	(12.3)	141.2	10	142.7	(24.4)	147.7	13	.64	.43	.53
Adaptive Behavior	1	91.5	(9.3)	89.1	10	92.4	(16.2)	94.8	13	.88	.36	.61
Motor	1	131.4	(21.0)	128.3	10	125.2	(24.9)	128.3	13	.00	.99	.00
Communication	1	90.7	(14.1)	85.9	10	84.4	(17.5)	89.1	13	.29	.60	.23
Cognitive	1	92.6	(10.1)	77.9	10	74.4	(15.6)	79.1	13	.07	.79	.12
Total	1	536.5	(52.3)	517.3	10	519.1	(87.2)	538.2	13	.50	.49	.40
Parenting Stress Index (PSI)												
Child Related	1	220.0	(40.1)	226.9	9	233.5	(27.0)	226.9	12	.00	.99	.00
Other	1	103.7	(17.1)	108.1	9	104.8	(20.6)	100.4	12	1.08	.31	.45
Family Support Scale (FSS)	1	29.1	(7.6)	28.4	9	29.6	(9.5)	30.3	11	.17	.68	.25

* This group contains only those children in the delayed group who remained in the same geographical area for the 18-month time period.

# Covariance adjusted means.

& Covariates: 0 = Days of care in NICU

^ $$ES = \frac{\text{Early Intervention with 11 or more adj. } \bar{x} - \text{Delayed Intervention adj. } \bar{x}}{\text{Delayed Intervention SD}}$$

Negative ES indicates that the early intervention group is doing less well than the delayed intervention group.

the parents of the early intervention group also reported statistically significantly less child-related stress than the delayed group. At Reassessment #5, there were again no statistically significant differences between the groups. All the children have not received the fourth and fifth assessments. When these cohorts are complete, these findings will be more easily interpreted.

Conclusions

This study addressed the age-at-start intervention question by comparing two randomly assigned groups of medically fragile infants who experienced neonatal intraventricular hemorrhaging. This longitudinal research design was methodologically sound with random assignment to treatment, implementation of treatment verification measures, use of pre- and post measurement, "blind" assessment by certified testers, and multiple measures of child and family functioning. Intervention began for one group (the early intervention group) when the children were 3 months of age (CCA), and for the other group (the delayed intervention group) when the children were 18 months of age (CCA).

The early intervention group received sensory motor intervention from a physical therapist until they were 18 months old. At 18 months of age children in both groups received home-based developmental intervention, with those who needed additional physical therapy receiving it. The determination of frequency of visits was individually determined based on the particular needs of each child and family, but a minimum of monthly visits was advised at least until the children reached the age of 30 months.

Recruitment of children into the sample took place between 1985 and 1988, as EIRI was notified by the participating hospitals of children who fit the sample requirements. The intervention portion of the study ended on September 1, 1990, but annual assessments have continued. The 18-, 30- and 42-month assessments are complete. The 90-month assessments have been started; other children have just completed their 42-, 54-, 66-, or 78-month assessment. Therefore, the results of Reassessments #1, #2, and #3 are final; those of Reassessments #4 and #5 are preliminary.

To assist with the integration of the large amount of data collected thus far, the graphical representation shown in Figure 5.1 has been created. The various

Salt Lake City Medically Fragile Study

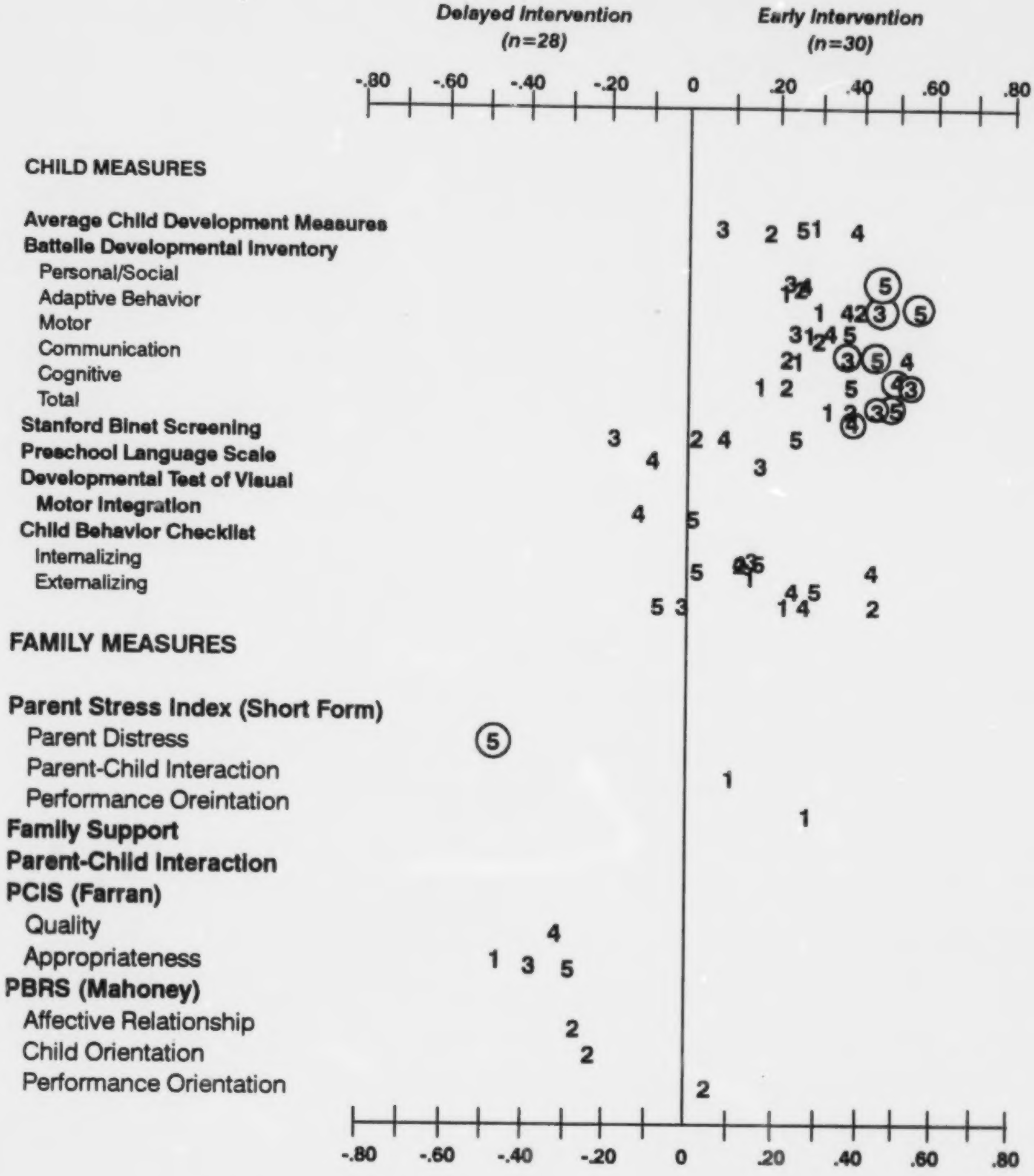


Figure 5.1. Graphical Representation of the Effect Sizes from Comparisons of Outcome Measures

measures of child and family functioning used in the five reassessments are listed down the left-hand side. The entries in the center of the figure represent the effect size for each measure at each time it was given (1, 2, 3, 4, or 5 for each respective reassessment). All reassessment scores are based on covariance adjusted means. Entries on the left side of the centerline indicate that the subjects in the delayed intervention group did better, and entries on the right side of the line indicate the early intervention group did better. Those that are statistically significant ($p \leq .10$) are circled. As can be seen, none of the findings were significant and most of the effect sizes were less than .33 (a third of a stanaard deviation of difference). However, more or the findings are on the right side and favor the early intervention group.

In examining the child development outcomes, there appears to be a trend of an increasingly greater advantage for the early intervention group across reassessments, particularly for the BDI Total score and the average of all the child development scores (refer to Figure 5.1). As was noted above, the findings for Reassessments #4 and #5 are preliminary. When these assessments are complete whether the trend really continues will be seen. However, at least until the age of 42 months, we must conclude that early intervention focused primarily on the facilitation of sensory motor development is not more effective in facilitating child development than is intervention delivered later. However, whether it provides a foundation from which later benefits emerge remains to be seen.

Analysis of the data collected on family functioning also demonstrate that the families in the two groups have thus far demonstrated similar interactional behaviors with their children, and comparable perceptions of family stress and social support. However, it is noteworthy that, although the differences were not statistically significant, the families in the early intervention group reported somewhat less stress and more social support across reassessments. However, since measures of parenting stress and social support were not collected at the initial assessment, it cannot be determined whether the groups were initially different on these variables.

Aside from the intervention information available from this study, this data set provides important information concerning the development of infants who have suffered major neonatal complications. Although all subjects experienced neonatal intraventricular hemorrhaging, a great diversity is seen within the sample on other birth characteristics and risk factors. The study is providing evidence concerning which neonatal factors predict later child functioning. Thus far, days spent in intensive care (NICU), the rating of the severity of sensory impairment, and the rating of the severity of neurological damage appear to be better predictors than birthweight, gestational age, or grade of IVH.

A great diversity in this sample is also witnessed in child functioning outcomes at the reassessments. Developmental quotients range from 10 to 110. Many of the children are developing normally, or near normally, but some are experiencing severe delays. For example, at the 42 month assessment 12 children (21% of the sample) scored lower than 70 (BDI computed developmental quotient). As the children continue to be followed, more will be learned about the development and school performance of medically fragile children.

At present, the preliminary conclusion from this study must be that to date earlier intervention focused primarily on sensory motor development did not result in statistically significantly greater benefits to either the children or their families. Issues concerning the intensity of the intervention may confound the implications of this study concerning the age-at-start question. Monthly visits by the physical therapist or home visitor is a typical service delivery pattern, (Roberts & Wasik, 1990), but is it frequent enough to affect any changes in parent perceptions and behaviors or child development? Initiating intervention earlier in life may show greater benefits than initiating it later if the intervention is more intensive. The intensity comparison subanalysis provides preliminary evidence on this question. Those children who received the recommended number of intervention visits did not perform significantly better on child development measures than did the children in the delayed intervention group at Reassessments #1, #2, or #5, but they did at Reassessments #3 and #4. When the cohorts for the fourth and fifth reassessments are complete, these findings will be more interpretable. However, it appears that there may be a delayed effect. Other studies (e.g., Brooks-Gunn, et al., 1992) have also found a delayed effect.

It is important to interpret study findings in relation to other research. The results of the current study present a contrast to results reported by Resnick et al. (1987, 1988), who found significant differences favoring infants receiving early intervention services. This study did, however, offer preliminary support and can be better compared to the findings of the Infant Health and Development project (1990) which found no treatment effects in a population similar to the one in this study even though the intervention was very intensive.

Finally, it is still possible that differences between treatment groups will be more apparent when the subjects in this study are older. The differences between the groups in child development appear to be getting greater. Raugh and associates (1988) likewise found that significant differences between experimental and control groups did not appear until 36 and 48 months, as did the Infant Health and Development Study (1990). Bennett (1987) reported that some less obvious disabilities were not apparent in children biologically at-risk for disabilities until they reached school age. The next several years of assessment will help answer these questions.

CHARLESTON, SOUTH CAROLINA IVH PROJECT

Project #6

COMPARISON: Infants with Grades I, II, III, and IV Intraventricular Hemorrhage (IVH)--Services begun at 3 months adjusted age versus services at 12 months.

LOCAL CONTACT PERSON: Conway Saylor, Ph.D.; Department of Psychology; The Citadel; Charleston, South Carolina

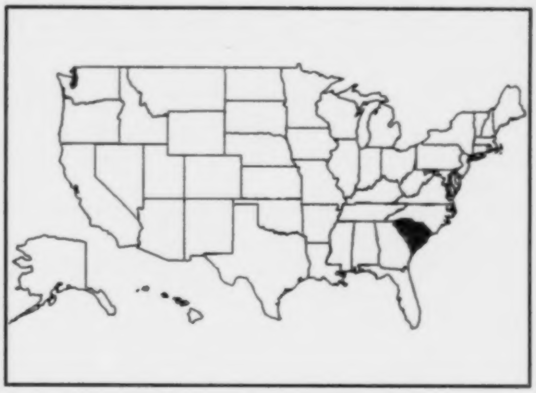
EIRI COORDINATOR: Conway Saylor, Ph.D.

LOCATION: Charleston, South Carolina

DATE OF REPORT: 10-1-1992

Rationale for the Study

One of the primary contributors to infant mortality is low birthweight (LBW). In the USA, 6.8% of all newborn babies are LBW (weighing 2500 g or less at birth), and about 1.2% are very-low birthweight (VLBW) (weighing 1500 g or less at birth). This amounts to approximately 225,000 low-birthweight infants per year (National Center for Health Statistics, 1989).



Forty percent of low birthweight infants (or approximately 90,000 infants per year) suffer periventricular-intraventricular hemorrhages (PVH-IVH) within 72 hours of birth. These hemorrhages produce abnormal bleeding from cranial capillaries and result in different degrees of neurological damage based upon the severity of the hemorrhage (Volpe, 1981). Brain-imaging procedures such as real-time ultrasonography and computed tomography (CT) scanning are used to make a positive identification of IVH and to classify the hemorrhage into one of four grades of severity, with Grade

I IVH the most mild form of hemorrhage, and Grade IV the most severe (Papile et al., 1978). Dramatic clinical symptoms such as seizures, loss of muscle tonus, cessation of breathing, and unreactive pupils may mark the onset of IVH; however, at times IVH is clinically silent (Tarby & Volpe, 1982). The importance of PVH-IVH as a major health problem is underscored by the following statistics (Volpe, 1987):

For each 1,000 LBW infants born--

- 400 suffer PVH-IVH
- 100 of the 400 (25%) die immediately
- 85 of the remaining 300 (28%) suffer major neuropsychological impairment

Information as to the future developmental progress of PVH-IVH survivors is somewhat limited and controversial (Hynd et al., 1984). Williamson et al. (1982) found that 29% of Grade I and II IVH LBW infants exhibited moderate disabilities by the age of 3, whereas Papile et al. (1983) found that only 15% of such children could be diagnosed as having these disabilities. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe disabilities, such as cerebral palsy, by the third year of life. Sostek et al. (1987) concluded that the severity of IVH did not predict the infant's developmental progress at 2 years of age; however, 40% of the infants in that study showed significant delays at 2 years. But, Bozynski et al. (1984) indicated that these infants are at especially high risk for later motor problems. In spite of compelling data that these infants are at high risk and increasing in number, there are too few longitudinal studies which carefully document the behavioral developmental course of these infants, much less the impact of intervention on that course (Vohr & Garcia-Coll, 1988). This study represents a significant expansion over previous studies of the low birthweight infants with IVH in that it involves longitudinal follow up of a relatively large group of them after random assignment to either early or delayed intervention. The details of this study will follow after brief mention of some of the pertinent literature.

Review of Selected Literature

Although there is a fair amount of research on interventions for premature low-birthweight babies (see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey et al., 1984; Sandall, 1990; for reviews), most have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention, and virtually all have excluded children who have suffered major neurological insults such as IVH. Exceptions include studies by Resnick et al.,(1987-88), and Piper et al., (1986), who included neurologically impaired infants.

Three recent studies examined the effectiveness of early sensory motor therapy for infants at-risk for developmental delays. Goodman et al. (1985) divided infants into high and low risk for motor problems based on an early assessment, and alternately assigned them to control and intervention groups. A program of weekly home visits began for the intervention group at three months of age. The results of this study indicated that the intervention group did not benefit from the intensive intervention. One methodological flaw with this study that was not clearly discussed in the report was the fact that infants in the control group who started to develop motor problems were removed from the control group and given intervention. This protocol might have resulted in those infants who could have demonstrated the efficacy of the intervention being removed from the analyses.

Piper et al. (1986) randomly assigned 134 NICU graduates weighing $\leq$ 1500 and/or having serious medical factors (birth asphyxia, seizures, CNS dysfunction with abnormal EEG tracings) to one of two groups. The control group had routine follow-up and referral through their neonatal follow-up programs. The experimental group received this routine follow-up as well as physical therapy intervention on a weekly basis for first three months and a biweekly basis for the next nine months. There were no significant differences between groups on any of the neuro-developmental measures administered at 12 months. Regardless of treatment condition, the ELBW subjects ($\leq$ 750 grams) exhibited more problems across measures compared to their "heavier" counterparts.

Palmer et al. (1988) randomly assigned 48 infants with mild and severe spastic diplegia to groups receiving either 12 months of physical therapy or 6 months of infant stimulation followed by 6 months of physical therapy. After 6 months of therapy, the infants in the physical therapy group had significantly lower scores on Bayley mental and motor scales and were less likely to walk. These differences persisted after 12 months of therapy. In addition, there were no significant differences in the number of infants with contractures or needing bracing, and the physical therapy group had lower mental development scores. The major difference between this study and the current study is the enrollment of children who already show motor problems, rather than those at risk for development of these problems.

Two highly intensive intervention programs produced somewhat conflicting results. Resnick et al., 1987 evaluated the effects of a multidisciplinary infant development program on low birthweight infants at 12 and 24 months of age and found significant differences favoring the experimental group on both physical and mental indices. The Infant Health and Development Program (1990) found similar differences at 36 months for all infants except those with IQ scores lower than 70. These infants failed to demonstrate any intervention effects. As discussed later, the differences in populations and intervention packages were so marked, it is hard to directly compare the present study and the IHDP. In sum, further research in this area is clearly indicated.

Overview of Study

There are no studies to date which examine parameters such as age-of-start in a controlled fashion with this population. There has been literature describing components of "state of the art" intervention for families of infants with handicapping conditions (e.g., McDonnell & Hardpan, 1988), and this intervention incorporated most of the recommended components (for review see Saylor, Levkoff, & Eklsnin, 1989). However, there is clearly a need to put our "best practice" techniques to the test in controlled, longitudinal studies such as the one that follows. As noted earlier, intervention programs for low-birthweight infants have generally focused on in-hospital stimulation or parent training intervention, and most have excluded children who have suffered major neurological insults such as IVH (for reviews see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey et al., 1984). At issue for this study are the effects and related costs of beginning intervention at different ages for infants who have serious medical problems and who routinely spend up to three months in intensive care units.

The specific comparison for this study was between infants receiving intensive motor-development oriented intervention beginning at 3 months corrected age and infants who began receiving comprehensive developmental services at 12 months of age. This comparison was chosen because a high proportion of the developmental problems encountered by these infants are motor development related. Since these infants routinely receive only medical follow-up until a particular problem or delay is noted, this study provided a good opportunity to test the age-at-start hypothesis.

Methods

This study was implemented in collaboration with the Departments of Pediatrics and Psychiatry of the Medical University of South Carolina in Charleston, South Carolina. The full-time staff of this intervention project consisted of a home interventionist and two physical therapists. The project was overseen on a part-time basis by a director and supported on a part-time basis by a Post Doctoral Fellow who served as coordinator, a diagnostician, and a secretary.

Subjects

The sample was composed of 66 infants recruited from both urban and rural areas around Charleston. Subject recruitment was closed in October, 1988. Of 66 originally recruited, 64 infants have received a pretest and a 12 month re-test, 58 infants have had their 24 month re-test, 57 infants their 36 month re-test, 23 their 54 month re-test, and 19 their 66 month re-test.

Recruitment and random assignment. Infants qualified for participation in the research if they had been patients in the NICU at the Medical University of South Carolina, if they had experienced intraventricular hemorrhage (IVH) or had a birthweight of less than 1000 g, and if they resided in the catchment area for treatment (60-mile radius). For purposes of assignment, severity of IVH was divided into mild (Grades I and II IVH) and severe (Grades III and IV IVH) categories.

Parents of eligible infants were contacted while the infant was still in the NICU, and subsequent telephone contact was made shortly after discharge. For each infant who met the study criteria, parents were required to indicate willingness to participate in either the experimental or the control conditions, depending upon where they were placed by random assignment. Infants with IVH were randomly assigned to treatment (Early) or control (Delayed) conditions by a roll of a four-sided die after stratification by severity of IVH (mild, Grade I or II, or Grade III or IV, severe) and birthweight (under 1000 g or over 1000 g). Those infants who had birthweights under 1000 g, but did not have IVH, were randomly assigned to treatment or control in a 5th cell.

The only people who knew the actual order of eligibility and enrollment of subjects were the site director and the research coordinator. The dates on which infants were born were the basis for sequence of enrollment, and infants were assigned to experimental conditions in order of eligibility.

Attrition. A total of 66 subjects were originally enrolled and pretested in this project. Two subjects withdrew their consent to participate immediately after being pre-tested and were thus never meaningful participants in the study. The remaining 64 of the infants enrolled were still in the program for the first re-assessment, 58 were seen for the second re-assessment, and 57 for the third re-assessment. Of the 9 who were not available by 36 month re-assessment, two dropped out immediately as described above, three died, two were lost when foster placement was repeatedly re-assigned, three relocated without giving the project notice or address information and/or declined to participate. Thus, the present findings are based on 97% of the originally enrolled subjects at re-assessment one, 88% at reassessment two, and 86% at re-assessment three. A series of t-tests showed no significant differences on medical or demographic variables for the 57 subjects completing 36 months and the 9 lost to follow up.

Medical and demographic characteristics. Table 6.1 summarizes the available demographic data for the 64 infants who represented the initial study participants. All of the children were from families who resided within sixty miles of Medical University of South Carolina in Charleston, South Carolina. This included populations from isolated rural areas, small towns, suburban areas, and the Charleston Metropolitan area. The ethnic background of the sample was approximately 65% Black and 35% Caucasian. All of the participants live in homes where English was the primary language, and there were slightly more two parent than single parent families (57% vs 43%). Forty-one percent of the enrolled families were receiving public assistance. Only one variable differed significantly between the early and delayed intervention groups. There was a higher proportion of males in the delayed intervention group than in the early intervention group (68% versus 30%, respectively).

Table 6.1

South Carolina Medically Fragile Study: Comparability of Demographic Characteristics for Subjects in Delayed vs Early Groups

	Groups							
	Delayed Intervention			Early Intervention				
Variable	$\bar{X}$	(SD)	N	$\bar{X}$	(SD)	N	p Value	ES♣
• Age of mother in years	29.3	(7.4)	30	28.0	(6.1)	34	.45	-.18
• Age of father in years	30.8	(6.7)	28	31.1	(6.5)	31	.87	.04
• Percent male*	30%		30	68%		34	.00	.75
• Years of education for mother	12.9	(2.0)	26	12.3	(2.1)	34	.27	-.30
• Years of education for father	12.7	(2.0)	23	12.4	(1.9)	31	.63	-.15
• Percent with both parents* living at home	55%		29	59%		34	.77	.07
• Percent of children who* are Caucasian	33%		30	38%		34	.71	.09
• Hours per week mother employed	17.8	(19.5)	17	14.3	(18.3)	23	.57	.18
• Hours per week father employed	39.9	(13.4)	18	41.0	(17.7)	20	.84	.08
• Percent of mothers* employed as technical managerial of above	11%		27	6%		34	.50	-.17
• Percent of fathers* employed as technical managerial of above	16%		25	4%		27	.19	-.35
• Total household income	$18,125	($19,650)	28	$14,662	($11,886)	34	.42	-.18
• Percent receiving public* assistance	41%		27	39%		33	.91	-.03
• Percent with mother as* primary caregiver	89%		28	94%		34	.53	.16
• Percent of children in* daycare more than 5 hours per week	40%		30	24%		34	.17	.33
• Number of siblings	1.1	(1.6)	28	1.1	(1.3)	34	.89	.00
• Percent with English* as primary language	100		29	100		34		

Tables 6.1 and 6.2 display the comparisons for medical and demographic data of the early versus delayed intervention groups. The only statistically significant difference between groups was that there were more males than females in the Early Intervention group. Although the differences were not statistically significant, the effect size magnitude called our attention to three medical variable group differences. Specifically, it was noted that the Early Intervention group had a lower mean gestational age (GA), a higher number of days on ventilation, and a higher percent of cases with Retinopathy of Prematurity (ROP). Because of their potential relationship to developmental outcomes, these variables, along with birthweight, seizures, IVH grade, and length of hospital stay were incorporated into a Medical Severity Index which was used as a covariate for subsequent group comparisons.

Table 6.2

South Carolina Medically Fragile Study: Comparability of Groups on Medical Characteristics

	Subjects Included in First Reassessment Analyses (N = 64)							
	Delayed Intervention			Early Intervention				
Variable	$\bar{X}$	(SD)	N	$\bar{X}$	(SD)	N	p Value	ES
• Birthweight (g)	1231	(518)	30	1107	(357)	34	.27	-.24
• Grade of IVH (% with Grade III or IV)	48		30	62		34	.27	-.27
• Gestational Age (Weeks)	30.3	(3.2)	30	28.9	(2.6)	34	.08	-.44
• Days on Ventilator	14.8	(23.7)	30	20.4	(23.4)	34	.34	.24
• Apnea (%)	43%		30	56%		34	.34	.23
• Seizures (%)	7%		30	15%		34	.39	.21
• Respiratory Distress Syndrome (%)	63%		30	79%		34	.17	-.34
• Bronchopulmonary Dysplasia (%)	36%		30	41%		34	.73	-.08
• Retinopathy of Prematurity (%)	30%		30	59%		34	.02	-.56

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* Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) on the $\bar{x}$ scores, divided by the standard deviation of the Delayed Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

• Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored as "0."

Alternative Intervention Programs

The comparison for this study was of an early versus delayed intervention program. Intervention occurred in two phases. During Phase I, the subjects assigned to the Early Intervention group received a sensorimotor intervention beginning when the infants were 3 months of age, and the Delayed Intervention group received the routine medical follow-up services available to the community in general. In Phase II, which began for all subjects at 12 months of age, all infants received home intervention services and sensorimotor services as needed.

Before the implementation of this project, all infants who were in Neonatal Intensive Care Units were referred to the South Carolina State Department of Health Neonatal Follow-up Clinic and received routine medical follow-up from private physicians or clinics. Previous funding for these services was provided by the South Carolina Department of Health, for those utilizing the follow-up service or by patient self-pay, for those using private physicians or clinics. These services remained the standard level of care for all infants in the treatment area during the period described in this report. Infants who were assigned to the control group for this project typically received no other services during the first phase of the study, as very few services were available. However, parents were able to access services in the community if they desired. Parents were queried about services they have accessed during the time period of the study, and these results are described later.

During both the early and delayed phases of the intervention project, the types of intervention services received were based on the Curriculum and Monitoring System (CAMS) (Casto, 1979). The Curriculum and Monitoring Systems (CAMS) is an early intervention curriculum system designed to meet the educational needs of young children with disabilities served by the Multi-Agency Project for Preschoolers (MAPPS). The project collected data attesting to the efficacy of the program and was validated as an exemplary program for national dissemination by the Joint Dissemination Review Panel (JDRP) of the U. S. Department of Education. It was revalidated in 1985. MAPPS is one of only 21 early intervention projects validated by the JDRP. MAPPS is also a National Diffusion Network (NDN) program and has replication sites nationwide.

Each of the curriculum programs is printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. With training, CAMS can be used by parents, teachers, and paraprofessionals in the home or an institutional/school setting.

The CAMS is designed to stimulate optimal development by programs in five areas: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development. The motor domain was the primary domain addressed during the early intervention. Beginning at 12 months, both delayed and early intervention subjects received intervention in all five domains.

The ***Receptive Language Program*** teaches the student skills that do not require the child to talk but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The ***Expressive Language Program*** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building articulation.

The ***Motor Program*** is designed to teach gross and fine motor skills. The program stimulates normal motor development, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The ***Self-Help Program*** is designed to teach basic skills for self care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The ***Social-Emotional Program*** is designed to teach basic social-emotional skills to both normal and developmentally delayed children. The program, which is sequenced developmentally, begins with teaching a child to respond to a person and proceeds through teaching him to handle frustration and exhibit self-control.

Early Intervention Program - 12 Months

Between 3 and 12 months corrected age, subjects in the early intervention group were scheduled for twice-monthly one-hour sessions with the physical therapist. The therapist worked with the infant and parents using the Motor Program of the CAMS (Casto, 1979). First, a placement test was administered in the motor skills domain to determine which objectives should be offered to the child. Second, curriculum books were provided with developmentally sequenced objectives and activities for assisting in a child's gross and fine motor development for ages birth to 5 years of age. Each child's program was individualized.

A typical intervention session was conducted by a therapist who worked with the child, with the parent present. The physical therapist also instructed the parent on exercises that the child could do at home, and the parent practiced and demonstrated competence on the exercises before beginning home intervention. The parents were requested to work with the child at home for at least 20 minutes per day, 5 days per week, on techniques they learned in the intervention sessions. The physical therapist telephoned the parent on weeks they did not meet to answer questions and provide guidance on implementation of intervention techniques. Attendance and progress were monitored on an ongoing basis by the physical therapist's progress notes, and the motor program placement test checklist were updated as goals were met.

24-Month Intervention Program

At 12 months corrected age, all subjects in the early and delayed intervention groups began expanded intervention programs utilizing all five domains of the CAMS programs. A child development specialist administered the CAMS placement tests, determined developmental levels, and set appropriate goals for intervention in each domain. All subjects were given placement tests in motor, social-emotional, self-help, receptive language, and expressive language domains and then participated in an expanded intervention program, which included weekly contacts with an infant specialist. The interventionist alternated twice monthly home visits with telephone contacts and encouraged parents to attend monthly center based sessions for parent-infant dyads.

A child development specialist was scheduled to meet with parent and child for one-hour every other week and provided intervention. For each session, an objective was determined for the child, the child development specialist modeled the training for the parent, and the parent demonstrated the technique. The parent was asked to spend 20 minutes each day, 5 days each week providing similar intervention with their child at home. The child development specialist called the parent via telephone weekly between home visits to check on progress and answer questions. When the child was seen for the next session, the child development specialist had the parent elicit the new behavior from the child. If the child demonstrated competence in that area, a new objective was chosen and modeled for the parent.

For example, the objective for a child might be to point out facial features. The specialist would teach the parent an exercise to teach the child facial features. At the next meeting, the specialist would have the child point out facial features. If the child showed competence in that area, a new objective would be established. Depending on their needs, some children would have objectives in several domains, others in only one. Recommendations were also provided to parents regarding problems or concerns such as toileting, feeding, or misbehavior.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, s/he was referred to a physical therapist for motor intervention through the usual community or MUSC-based programs. Those children in the early intervention group who still required motor services either continued meeting with the physical therapist or was referred on as above. If a child who received motor services in the early intervention group no longer required those services, those services were discontinued and home intervention was delivered based on the needs of the child.

In addition to the goals centered on infant developmental progress, individual family goals were set and addressed utilizing processes which eventually were formalized as IFSPs (Individualized Family Service Plans). Especially after the child's second birthday, the IFSP's tended to include goals related to qualifying for and seeking funding for appropriate additional services. Children were transitioned out of the program between their second and third birthdays, depending on the availability of needed services and the lag time in the assessment and referral process.

Treatment Verification

White et al. (1987) discussed two important issues in verifying that an early intervention program occurred as it was intended. First, delivery of intervention must be examined to ascertain that the program which is being delivered is the same as that which was described in the methodology of the proposal and reports. Second, the extent to which infants and their parents received and participated in the program must be examined. The SC-IVH project implemented several procedures to verify that the intervention was implemented as intended.

The first treatment verification procedure was a formal site review, conducted annually. The SC-IVH site reviews were conducted on September 20-21, 1987, April 25, 1988, and June 1, 1989. The purpose of the site review was to collect information regarding the nature and quality of the early intervention services delivered at this site. Documentation of treatment implementation occurred to ascertain that the intervention services were provided as intended and that the project remained faithful to the research protocol. The site review was conducted according to procedures described in the Guide for Site Reviews of EIRI Research Sites, in the Treatment Verification Handbook for Research Sites (EIRI, 1987). The site was rated excellent on all aspects of the evaluation at all visits, except for implementation of formal Individualized Family Service Plans. Although family issues were being addressed, S.C. had not formalized its guidelines for the IFSP, and there was no document of this specific title and format on the charts of the oldest participants in the projects. A final site review was conducted in May 1990, to discuss the evaluation and intervention for the infants under the EIRI protocol.

In addition to verifying that the intervention program continued to be implemented as originally intended, three methods were used to examine parental participation in the intervention. First, the interventionists tracked the number of center and home based visits that an infant attended during each month. Second, the interventionists asked the parents once a month to estimate the amount of time during the past week that they spent working with their infant on activities suggested by the interventionist. When the interventionist recorded this information, they also rated the parents' accuracy of estimation. Finally, the interventionist were asked to rate the parents once a year on three aspects of their participation in the intervention program. The interventionists used three point scales (1 = low, 2 = average, and 3 = high) to rate the parents' attendance of scheduled appointments, their knowledge of the information that the intervention was designed to provide, and their support of the goals and methods of the intervention program. Table 6.3 represents the data on the sensory motor (Phase I - ages 3-12 mo) intervention based on these treatment verification methods.

Table 6.3

Parent Participation in the Phase I Sensorimotor Intervention

Variables	n	$\bar{x}$	(SD)	Minimum	Maximum
Percent of scheduled visits attended	29	64		17	120
Number of hours per month working with[♦] interventionist	29	1.3	(.5)	.3	2.4
Number of Hours per week working with child on suggested activities (Parent Report)	16	2.2	(.7)	1.3	3.5
Interventionists' rating of accuracy of[*] parents' time report	16	2.3	(.6)	1	3
Interventionists' rating of quality of[*] parent participation					
1. Attendance	29	2.1	(.8)	1	3
2. Knowledge	29	2.2	(.7)	1	3
3. Support	29	2.2	(.8)	1	3

[♦] Based on percentage of scheduled visits attended x 2 hours per visit.
[*] 1 = low, 2 = Average, 3 = high

Additional treatment verification was undertaken during 1990-1991 to verify participation in intervention after 12 months (Phase II-all participants). A structured interview soliciting both quantitative and qualitative data about treatment participation was administered by a Post-doctoral level, skilled clinical researcher to 47 of the 58 families, still active in the study. In addition to soliciting retrospective data about level of participation in this program and reasons for transition/termination, the interviewer collected data about concurrent therapies and services accessed by the families, and received releases of information to verify and elaborate on information provided by parents. Subanalyses reported in later sections compare high participation and low participation families on these dimensions.

Cost of Alternative Interventions

The cost of delayed versus early intervention was determined using the "ingredients" approach described by Levin (1983). The figures in Table 6.4 are based on actual expenses for each, including personnel, space, equipment, supplies and volunteer time. The cost per child for the Early Intervention group represents the accumulated costs of intervention from October 1986 to October 1988. For Early Intervention participants the total program cost was for two years, (from 3 months adjusted age to twenty seven months adjusted age) and two phases of intervention as outlined under the intervention program description. The cost per child for the Delayed Intervention group represents the cost for services from the date these children turned 12 months of age and services began until October 1988, the end of FY 1987-88. In Table 6.4, cost per child estimates in Years 1 and 2 are adjusted for inflation so that all figures are comparable in 1990 constant dollars.

Table 6.4

Cost Per Child for South Carolina IVH Site (1990 Dollars)

Resources	Early Intervention	Delayed Intervention
Agency Resources		
Direct Service Personnel	$3,140	$1,220
Administration		
Program	1,660	771
University	1,435	639
Occupancy	307	101
Equipment	56	17
Transportation	600	443
Materials/Supplies	146	74
Telephone	71	36
Subtotal	**$7,415**	**$3,301**
Contributed Resources		
Parent Time	2,500	1,221
Others	16	
Subtotal	**$2,516**	**$1,221**
TOTAL	***$9,931***	***$4,522***

* *Totals may not add up due to rounding errors.*

To arrive at the cost per child, total program costs were determined for each group and divided by the number of children in the group: in Year 1, the total number of children receiving intervention was 24; in Year 2, 38 children (both treatment and control) were receiving services. As illustrated in Table 6.4, program costs included direct service and program and university administration, occupancy, equipment, transportation, materials and supplies, and telephone used for the respective groups.

Direct service personnel costs included wages and benefits for the physical therapist, and the interventionists. Each of these were pro-rated according to actual time spent on intervention-related activities. Program administrative costs included the pro-rated salaries and benefits for the psychologist, coordinator, interventionist, and secretary according to their time spent on administrative duties for the intervention. Research costs in this, and all other resource categories, naturally, were excluded. The university administrative cost was based on the university indirect rate for general, departmental, and sponsored projects administration (24%). Occupancy charges were calculated based on the University's rate per square foot for office space, utilities, maintenance, and insurance pro-rated according to program usage. Equipment costs included the cost of office furniture and intervention equipment. These costs were based on market replacement values for each item which are annualized at a rate which accounts for interest and depreciation and pro-rated according to program usage to determine the annual equipment cost. Agency transportation cost for home visits were calculated at $.21 per mile based on actual mileage. In addition, the project reimbursed several parents for bringing their child to the center for PT treatments in Year One.

Because the program relied heavily on parent participation for both home visits and conducting intervention with their own child in the home, the opportunity cost of parent time was also included. These costs are presented as "contributed resources" on Table 6.4. Parent time included time spent in (1) center and home visit sessions with either the physical therapist or the interventionist; and (2) intervention activities recommended by the program for each parent and child at home. Parents spent an average of 121.2 hours per year in session with professionals and conducting intervention activities at home. Parent time was assigned the value of $9 per hour based on the average hourly earnings plus benefits for full-time work for women in the U.S.

Thus, for children entering the program at 3 months adjusted age and receiving two years of individualized intervention from both professionals and their professionally trained parents, the undiscounted cost of the program was $9,931 per child, while for children entering the program later at 12 months, the undiscounted cost was $4,522 including the value of parent time. The cost per child for intervention in Year 2 was less than Year 1 because of the greater emphasis on physical therapy in Year 1, which costs more than services from the educationally-trained interventionists who picked children up in year two.

Data Collection

Data were collected for this study to determine the effects of intervention upon the child and the family. The assessment instruments were chosen to provide some consistency of data collection across sites, but also to provide information about children who experienced intraventricular hemorrhage at birth and the unique experiences of their families. In the subsequent section the measures were collected by a local diagnostician who was unaware of the group membership of children or the specific purposes of the study. Testing was scheduled directly with the diagnostician by the site coordinator. Children were enrolled in this study in two cohorts. The first 18 children were enrolled before the full battery of pretest measures was finalized. Therefore, the pretest for these children consisted only of the Battelle Developmental Inventory (BDI). The next 45 children were enrolled after the full testing battery (described below) had been developed. Forty-five (70%) of the infants who reached the first re-assessment received the full assessment battery at pretest.

Recruitment, training, and monitoring of diagnosticians. All testers recruited for the study successfully completed the certification process required for administration of the Battelle Developmental Inventory. The training involved approximately 4 hours of independent study, 8 hours of group training, and a minimum of three practice administrations with 85% interrater agreement required. All of the diagnosticians has a master's degree in Clinical Psychology or an advanced degree and/or certification in Clinical or School Psychology, and had extensive experience assessing children. All the testers were naive to the subject assignment. A doctoral level supervisor with a doctoral degree in school or clinical psychology coordinated the scheduling of the testing, collected the family measures, and ensured the quality of the test results via tester reliability checks and double-checking protocols.

Pretest. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months), all infants were tested with the Battelle Developmental Inventory (BDI). At the same time the parents completed the Parenting Stress Index (PSI), an assessment of the stress perceived by the parents; the Family Support Scale (FSS), a measure of the number of different sources of support available to families with young children; the Family Resource Scale (FRS), a measure of the different kinds of resources available; the Family Inventory of Life Events and Changes (FILE), which assesses the life events and changes experienced by the family during the previous 12 months; and the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the cohesiveness and adaptability of the family. All test and questionnaire protocols were sent to the program coordinator for scoring and placement in a data file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the newborn.

Reassessment. Reassessments occurred first at 12 months corrected age and annually thereafter. The reassessment battery was administered by diagnosticians who were "blind" to the subject's group assignment. The child was given the BDI; the parent completed the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the previous year, and a parent demographic survey. In addition, videotapes were made of mother-infant interaction in a semi-structured play session.

The parent-child interaction videotape involved the parent and child in play activities. In the first section, the mother and child were asked to play together for 15 minutes "as they would at home." Then, for one minute, the parent encouraged the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent was asked to leave the room for 45 seconds, and taping continued for two minutes after the parent returned to the room. Parents were paid a $30 incentive for the testing and videotaping.

Tables 6.5 and 6.6 summarize the instruments administered and the number of subjects tested with each instrument at each observation period.

Table 6.5

Number of Subjects Receiving Each Part of SC-IVH Assessment in First Three Years

Measures	Pretest 3 months AA	First Posttest 12 months AA	Second Posttest 24 months AA	Third Posttest 36 months AA
BDI	66	64	58	57
Binet	n/a	n/a	n/a	57
MCDI[*]	n/a	50	55	
PSI	48	64	58	57
FSS	48	64	58	57
FRS	48	64	58	57
FILE	48	64	58	57
FACES	48	64	58	57
Video	48	64	58	57

[*] For the older subjects, 12 months MCDI's were collected in a separate clinic scheduled two to three months earlier (12 mo CA) and were not considered valid for outcomes in this study. At two and three year data points, missing data on most measures reflects parents' failure to complete the form as requested. Missing video data reflects technical difficulties in recording or coding the tapes.

Table 6.6

Description of Tests Administered for SC-IVH Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Stanford-Binet Intelligence Test Form L-M (Terman & Merrill, 1973)	The Stanford-Binet is a norm-referenced measure of general intellectual ability.
Minnesota Child Development Inventory (Ireton & Thwig, 1974)	The MCDI is a maternal report paper and pencil measure which provides norm-referenced age-equivalent scores in general development, gross and fine motor, expressive language, comprehension-conceptual, situation comprehension, and self-help skills.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
Parent-Infant Interaction Videotape	Semi-structured play session which could subsequently be scored by raters "blind" to experimental group of child.

Results and Discussion

The purpose of this study was to examine the effectiveness of an early, intensive motor intervention and subsequent comprehensive developmental intervention compared to a delayed comprehensive developmental intervention for a group of infants at risk for developmental delays because of a history of intraventricular hemorrhage and/or very low birthweight.

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Comparability of Groups on Pretest Measures

Table 6.7 summarizes the analyses of the comparability of first-re-assessment (12 mo.) groups on the pretest child and family functioning measures. There were no statistically significant differences on any of the pretest measures of infant development or family functioning. Table 6.8 makes the same comparisons for the 58 subjects at the second reassessment. Because only one subject was lost from the second to the third reassessment, these analyses are presented in Table form only for the first and second reassessment population.

Table 6.7

Comparability of Groups on Pretest Measures for 64 subjects in SC IVH-Year One Analyses

Variable	Delayed Intervention			Early Intervention			ANCOVA F	p Value	ES♦
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n			
· **Age in Months at Posttest**	3.5	(.9)	30	3.4	(1.0)	34			
· **Battelle Developmental Inventory (BDI)**									
Raw Scores for:									
Personal/Social	16.4	(5.5)	30	17.2	(5.3)	34	.41	.52	-.15
Adaptive Behavior	12.1	(5.1)	30	12.2	(5.4)	34	.01	.92	.02
Motor	12.1	(5.1)	30	12.0	(4.3)	34	.01	.94	-.02
Communication	8.5	(3.1)	30	8.3	(3.1)	34	.03	.86	-.06
Cognitive	5.6	(3.6)	30	5.6	(2.5)	34	.00	.95	.00
TOTAL	56.0	(20.2)	30	54.2	(15.4)	34	.17	.68	-.09
· **Parenting Stress Index (PSI)**									
Child Related	109.9	(20.3)	20	113.9	(13.9)	28	.68	.41	-.20
Other Related	119.0	(24.6)	20	126.1	(26.5)	28	.89	.35	-.29
TOTAL	228.9	(40.3)	20	239.9	(36.5)	28	.99	.33	-.27
· **Family Adaptation and Cohesion Evaluation Scales (FACES)**									
Adaptation	23.4	(7.8)	18	23.1	(7.0)	26	.02	.89	-.04
Cohesion	39.3	(5.5)	18	37.5	(6.8)	26	.89	.35	-.33
· **Family Resource Scale (FRS)♠**	119.9	(17.3)	16	125.1	(54.1)	26	.14	.71	.30
· **Family Support Scale (FSS)♠**	11.1	(5.7)	18	11.2	(10.6)	26	.00	.97	-.02
· **Family Index of Life♠ Events and Changes (FILE)**	31.3	(13.8)	18	26.8	(12.3)	26	1.31	.26	-.33

♦ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

Table 6.8

Comparability of Groups on Pretest Measures for 58 subjects in SC IVH-Year Two Analyses

Variable	Delayed Intervention			Early Intervention			ANCOVA F	p Value	ES♠
	x̄	(SD)	n	x̄	(SD)	n			
• **Battelle Developmental Inventory (BDI)**									
Raw Scores for:									
Personal/Social	16.6	(5.4)	27	17.2	(5.2)	31	.19	.67	.11
Adaptive Behavior	11.9	(5.0)	27	11.8	(5.5)	31	.00	.96	-.02
Motor	12.0	(4.1)	27	12.0	(4.4)	31	.00	.98	.00
Communication	8.5	(3.0)	27	8.3	(3.2)	31	.10	.75	-.07
Cognitive	6.0	(3.6)	27	5.7	(2.6)	31	.12	.73	-.08
TOTAL	56.1	(18.7)	27	53.7	(15.3)	31	.29	.59	-.13
• **Parenting Stress Index (PSI)**									
Child Related	108.1	(19.8)	18	114.6	(13.9)	25	1.61	.21	-.33
Other Related	119.3	(25.0)	18	127.3	(23.5)	25	1.13	.29	-.32
TOTAL	227.4	(39.4)	18	241.8	(33.0)	25	1.67	.20	-.37
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**									
Adaptation	23.5	(7.8)	16	22.0	(6.5)	23	.39	.54	-.39
Cohesion	39.1	(5.6)	16	36.3	(6.4)	23	1.93	.17	-.50
• **Family Resource Scale (FRS)♠**	119.4	(18.8)	16	122.9	(57.3)	23	.05	.83	.19
• **Family Support Scale (FSS)♠**	10.1	(5.5)	16	11.9	(11.2)	23	.35	.56	-.33
• **Family Index of Life♠ Events and Changes (FILE)**	31.1	(13.4)	16	25.9	(12.2)	23	1.56	.22	-.39

♠ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

Effects of Early Versus Delayed Intervention on Measures of Child and Family Functioning

Selection of covariates. The effects of the early intervention program on child and family functioning were analyzed using one-way analyses of covariance (ANCOVA). ANCOVA procedures were employed for two purposes: (a) to increase the statistical power of the analyses by reducing error variance; and (b) to statistically adjust for any pretreatment differences between the groups. As noted in description of the subjects, there were several potentially clinically significant medical variables which varied at statistically non-significant levels between groups. Because of their potential impact, these medical factors were added into a Medical Severity Index (MSI) score, which was computed for each subject as summarized in Figure One, and was entered as a covariate on all subsequent analyses.

Analyses of Outcomes. Table 6.9 summarizes the results from the first reassessment analysis (12 months). At this point, only the "Early Intervention" group had received intervention. The results of the analyses of the child and family measures indicated that after 9 months of intensive motor oriented intervention, the infants in the Early Intervention group had made less progress than control subjects in several developmental domains. It is particularly important that, according to non-adjusted means, the infants were doing more poorly in the gross motor and overall motor areas as the intervention during the first year was specifically targeted to motor development. When MSI was covaried, the significance of this differences favoring "delayed intervention" subjects. Parent report on the MCDI was consistent with the Battelle in showing few statistically significant differences but marked trends in the direction of delayed (no) intervention subjects being described as more advanced (on average "normal" for chronological age) compared to those in early intervention with Physical Therapist (PT) in year one. Analysis of family measures showed virtually no difference between the Delayed (no) Intervention and Early Intervention subjects. Although not tabled, group comparison of parent-infant interaction dimensions as rated on the Parent-Caregiver Involvement Scale (PCIS) also yielded no significant differences.

The same analysis procedure was followed for the second re-assessment which was given at 24 months of age. Fifty-eight infants received this re-assessment. The results of the analyses of the child and family measures are presented in Table 6.10. At the second reassessment, there were no significant differences between the two groups on the Battelle Developmental Inventory, on the MCDI, or on any of the family

Table 6.9

First Reassessment (12 month) Measures of Child & Family Functioning for Delayed (no) Intervention Group vs. Early Intervention Group for SC-IVH Study, with Medical Severity Index (MSI) as Covariate

	Delayed (No) Intervention				Early Intervention						
Variable	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj $\bar{X}$	n	ANCOVA F	p value	ES♣
Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal/Social	39.3	(10.3)	38.6	30	34.6	(9.8)	35.2	34	1.81	.18	-.33
Adaptive Behavior	32.2	(7.6)	31.7	30	30.5	(7.4)	30.9	34	.15	.70	-.11
Gross Motor	29.1	(10.6)	28.3	30	24.6	(8.9)	25.3	34	1.53	.22	-.28
Fine Motor	15.5	(6.0)	15.2	30	14.0	(4.6)	14.3	34	.44	.51	-.15
Motor	44.5	(15.6)	43.5	30	38.3	(12.5)	39.3	34	1.41	.24	-.27
Total Communication	22.4	(6.2)	22.0	30	19.4	(5.9)	19.8	34	2.00	.16	-.35
Receptive	11.2	(2.8)	11.0	30	9.5	(3.2)	9.6	34	3.45	.07	-.50
Expressive	11.2	(3.9)	10.9	30	10.0	(3.1)	10.2	34	.59	.45	-.18
Cognitive	18.1	(5.8)	17.7	30	17.7	(4.9)	18.0	34	.08	.78	.05
TOTAL RAW	156.5	(42.5)	153.5	30	140.6	(35.9)	143.1	34	1.10	.30	-.24
Minnesota Child Development Inventory (MCDI)♦											
General Development	93	(31)	91	26	84	(28)	85	31	.61	.44	-.19
Gross Motor	90	(30)	88	26	79	(24)	81	31	.87	.36	-.23
Fine Motor	89	(26)	87	26	85	(31)	85	31	.12	.73	-.08
Express.Language	91	(28)	89	26	88	(21)	89	31	.00	.95	0
Conceptual Comprehension	99	(45)	96	26	86	(25)	89	31	.59	.45	-.16
Situation Comprehension	92	(33)	88	26	82	(29)	84	31	.26	.61	-.12
Self-Help	100	(43)	99	26	86	(28)	88	31	1.22	.27	-.26
Personal Social	95	(33)	94	26	81	(24)	81	31	2.60	.11	5.00
Parenting Stress Index (PSI)											
Child Related	110.1	(23.1)	112.0	27	110.9	(20.9)	112.5	33	.01	.94	-.02
Other Related	122.8	(27.5)	123.6	27	125.1	(35.1)	126.5	33	.09	.76	-.11
TOTAL	232.9	(46.2)	235.6	27	236.5	(50.7)	239.1	33	.06	.81	-.08
Family Adaptation and Cohesion Evaluation Scales (FACES)											
Adaptation	21.6	(6.0)	21.4	21	21.6	(7.1)	21.8	30	.04	.85	.07
Cohesion	35.8	(7.5)	35.7	21	37.1	(8.6)	37.2	30	.38	.54	.20
Family Resource Scale (FRS)♠	117.3	(17.2)	117.6	22	116.6	(23.9)	117.7	31	.00	.98	.01
Family Support Scale (FSS)♠	30.6	(14.2)	30.4	22	28.3	(13.1)	28.5	30	.24	.63	-.13
Family Index of Life♠ Events and Changes (FILE)	8.8	(7.5)	7.5	20	8.8	(6.5)	9.8	28	.78	.38	.31

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) Adjusted means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size), except for PSI, on which direction is reversed.

♦ Scores were calculated by computing a ratio of developmental score in months/chronological age in months.

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

Table 6.10

Second Reassessment (24 month) Measures of Child & Family Functioning for Delayed (no) Intervention Group vs. Early Intervention Group for SC-IVH Study, with Medical Severity Index (MSI) as Covariate

	Delayed (No) Intervention				Early Intervention						
Variable	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj X	n	ANCOVA F	p value	ES[◆]
· Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal/Social	67.3	(16.4)	66.7	27	63.5	(17.1)	64.1	31	.34	.57	-.16
Adaptive Behavior	51.5	(12.7)	50.9	27	47.9	(11.4)	48.4	31	.63	.43	-.20
Gross Motor	45.6	(11.7)	44.9	27	40.7	(15.3)	41.3	31	.96	.33	-.31
Fine Motor	25.2	(7.4)	24.9	27	24.6	(7.4)	24.8	31	.00	.99	-.01
Motor	70.8	(18.0)	69.8	27	65.3	(21.3)	66.2	31	.47	.50	-.20
Total Communication	34.4	(8.0)	34.0	27	31.3	(9.1)	31.6	31	1.04	.31	-.30
Receptive	14.2	(2.9)	14.1	27	13.4	(3.3)	13.4	31	.59	.45	-.24
Expressive	20.2	(5.9)	19.9	27	17.9	(6.2)	18.2	31	1.10	.29	-.29
Cognitive	25.6	(7.2)	25.2	27	22.9	(6.0)	23.2	31	1.38	.25	-.28
TOTAL RAW	247.4	(57.6)	244.6	27	230.8	(57.6)	233.3	31	.55	.46	-.20
· Minnesota Child Development Inventory (MCDI)[♦]											
General Development	94	(26)	93	26	87	(28)	88	31	.41	.53	-.19
Gross Motor	104	(41)	103	26	87	(37)	88	31	2.05	.16	-.37
Fine Motor	104	(34)	103	26	95	(26)	96	31	.77	.39	-.21
Express.Language	95	(26)	93	26	91	(25)	93	31	.01	.91	0
Conceptual Comprehension	95	(26)	94	26	94	(32)	94	31	.01	.94	0
Situation Comprehension	100	(40)	99	26	91	(25)	91	31	.74	.40	-2.40
Self-Help	103	(42)	103	26	95	(32)	96	31	.45	.51	-1.70
Personal Social	94	(32)	92	26	90	(27)	90	31	.04	.84	-.06
· Parenting Stress Index (PSI)											
Child Related	109.0	(19.4)	108.9	27	111.3	(22.1)	111.5	31	.21	.65	-.13
Other Related	118.4	(22.20	118.3	27	129.0	(27.5)	129.1	31	2.51	.12	-.49
TOTAL	227.4	(37.0)	227.0	27	239.4	(43.6)	239.7	31	1.32	.23	-.34
· Family Adaptation and Cohesion Evaluation Scales (FACES)											
Adaptation	22.0	(5.8)	21.9	27	20.2	(5.7)	20.3	31	1.12	.30	-.28
Cohesion	38.1	(6.1)	37.9	27	36.4	(7.9)	36.6	31	.50	.48	-.21
· Family Resource Scale (FRS)[♠]	115.7	(19.4)	115.7	26	112.2	(20.6)	112.2	30	.41	.52	-.18
· Family Support Scale (FSS)[♠]	31.7	(14.7)	32.6	27	27.0	(11.6)	27.0	31	2.56	.12	-.38
· Family Index of Life[♠] Events and Changes (FILE)	8.4	(6.2)	6.8	27	10.0	(10.4)	9.4	30	.63	.43	-.42

(continued)

[◆] Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) Adjusted means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size), except for PSI on which direction is reversed.

[♦] Scores were calculated by computing a ratio of developmental score in months/chronological age in months.

[♠] Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

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measures. Although there were no statistically significant differences between the groups, it was noteworthy that the delayed intervention group had lower scores on the Parenting Stress Index for non-child-related stress (ES = -.49), reported more social support on the FSS (ES = .38), and reported fewer major life events (ES = -.42) compared to early intervention subjects.

The third reassessment (36 months) showed a similar pattern in the progress of delayed vs. early intervention participants. There were no significant differences between delayed and early on any of the outcome measures, including parent-infant interaction (not tabled). The trends noted at the second re-assessment for the early intervention group to seem more stressed and less well-supported disappeared for the most part at this re-assessment, though FSS scores still varied somewhat (ES = -.39). These results are summarized in Table 6.11.

Preliminary Analysis of 54 Month and 66 Month Data

Preliminary analyses were conducted in similar fashion to examine the likely direction of outcomes at the fourth and fifth reassessments. In examining these results, it is important to note the following: during a funding gap, 12 subjects did not receive the 54 month evaluation, but returned for the 66 month evaluation once funding was reinstated. Thus, only 23 subjects (11 Delayed Int., 12 Early Int.) have been re-assessed at the 54 month level to date. Another 22 subjects are expected to complete the 54 month re-assessment in the coming year and a half as they reach the appropriate age level. The 12 subjects who missed the 54 month evaluation during the funding gap were the oldest subjects, first enrolled and first to reach the 66 month re-assessment. Thus, the preliminary sample of 19 subjects (9 Delayed Int., 10 Early Int.) at 66 months is quite a different sample from the 54 month reassessment, with only 7 overlapping subjects.

Table 6.11

Third Reassessment (36 month) Measures of Child & Family Functioning for Delayed (no) Intervention Group vs. Early Intervention Group for SC-IVH Study, with Medical Severity Index (MSI) as Covariate

	Delayed (No) Intervention				Early Intervention						
Variable	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj X	n	ANCOVA F	p value	ES♠
• **Battelle Developmental Inventory (BDI)**											
Raw Scores for:											
Personal/Social	94.7	(27.5)	93.7	27	89.6	(30.0)	90.5	30	.17	.68	-.12
Adaptive Behavior	69.8	(18.4)	69.1	27	62.8	(17.9)	63.5	30	1.30	.26	-.30
Gross Motor	54.0	(15.3)	53.0	27	48.1	(16.6)	49.0	30	.85	.36	-.26
Fine Motor	34.2	(10.3)	33.6	27	30.6	(10.0)	31.1	30	.83	.37	-.24
Motor	88.2	(24.9)	86.5	27	78.6	(25.3)	80.1	30	.92	.34	-.26
Total Communication	44.3	(12.5)	43.9	27	39.8	(13.2)	40.1	30	1.12	.30	-.30
Receptive	17.3	(5.5)	17.2	27	15.4	(6.0)	15.6	30	.97	.33	-.29
Expressive	26.9	(8.0)	26.6	27	24.4	(7.9)	24.6	30	.91	.34	-.25
Cognitive	34.6	(12.2)	34.4	27	31.5	(10.5)	31.7	30	.72	.40	-.22
TOTAL RAW	331.1	(86.5)	327.2	27	302.4	(86.7)	306.0	30	.81	.37	-.25
• **Minnesota Child Development Inventory (MCDI)♦**											
General Development	100	(62)	100	26	87	(45)	89	30	.63	.43	-1.80
Gross Motor	94	(50)	93	26	78	(46)	80	30	1.06	.31	-.26
Fine Motor	86	(40)	85	26	77	(34)	78	30	.52	.48	-.18
Express.Language	84	(29)	84	26	83	(35)	84	30	.01	.93	0
Conceptual Comprehension	93	(36)	92	26	84	(37)	85	30	.52	.47	-.19
Situation Comprehension	94	(45)	93	26	86	(42)	88	30	.19	.66	-.11
Self-Help	100	(50)	99	26	89	(39)	90	30	.51	.48	-.18
Personal Social	85	(39)	83	26	75	(30)	75	30	.76	.39	-.21
• **Parenting Stress Index (PSI)**											
Child Related	116.5	(23.1)	115.9	26	112.3	(23.4)	112.9	30	.23	.64	.13
Other Related	128.3	(23.8)	127.0	26	122.7	(27.4)	123.9	30	.20	.66	.13
TOTAL	244.8	(42.0)	242.9	26	235.1	(43.6)	236.7	30	.28	.60	.15
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**											
Adaptation	22.0	(8.0)	20.8	25	20.4	(6.1)	20.3	29	.07	.80	-.06
Cohesion	36.4	(6.0)	37.0	25	36.7	(8.2)	36.7	29	.02	.89	-.05
• **Family Resource Scale (FRS)♠**	108.5	(23.7)	108.5	26	111.2	(22.6)	111.2	29	.18	.68	.11
• **Family Support Scale (FSS)♠**	31.9	(17.4)	32.4	26	26.0	(10.4)	25.6	29	3.13	.08	-.39
• **Family Index of Life♠ Events and Changes (FILE)**	7.5	(5.3)	6.2	26	6.7	(4.9)	7.6	30	.65	.43	.26

♠ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) Adjusted means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size), except for PSI on which direction is reversed.

♦ Scores were calculated by computing a ratio of developmental score in months/chronological age in months.

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

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T-test comparisons demonstrated that neither the 54 month sample nor the 66 month sample differed significantly from the populations who missed or are still awaiting testing (on medical, demographic, and pre-test variables). Thus, in spite of small numbers and sample differences, these populations may be considered "representative" enough to be providing an accurate preview of data to come.

Examination of initial differences within the 54 month sample using a series of T-tests showed no significant differences between groups on medical, demographic, or pretest scores at 3 months adjusted age. Analysis of covariance, with MSI as covariate on the 54 month reassessment data for this sample showed no group differences between early versus delayed intervention groups on any of the developmental measures (Battelle, Stanford Binet IV) or family measures (PSI, FRS, FSS). Thus, preliminary analyses suggest a continued trend to see no group differences at age 4 1/2. Results are summarized in Table 6.12.

The 66 month reassessment is problematic for several reasons. First, even though the subtle pretreatment medical differences between groups have failed to reach significant levels in the full samples to date, there are clear pretreatment differences for this initial sample of 19. Specifically, the Medical Severity Index score for the 10 Early Intervention subjects was significantly higher (worse) than that of the 9 Delayed Treatment subjects in this subsample (T= -3.30, p < .005). In addition, the Early Intervention (experimental) subjects in this subsample tended to have more days on vent ($\underline{t}$ = 2.01, p < .06), and lower gestational ages (t=1.93, p<.07).

These pretreatment differences obviously minimize even further the utility of this "first look" at 66 month outcomes. An MSI covariate could not be expected to completely equalize this disparity. In spite of this problem, analyses were conducted for the sake of exploration and discussion. Specifically, we have had the haunting sense that in spite of enormous efforts to randomize and stratify into two equal

Table 6.12

54-Month Reassessment Measures of Child and Family Functioning for Delayed vs. Early Intervention Groups for SC-IVH Study, with Medical Severity Index (MSI) as a Covariate

	Delayed (No) Intervention				Early Intervention						
Variable	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj X	n	ANCOVA F	p value	ES♦
• Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal/Social	35.1	(8.7)	34.1	11	28.9	(15.7)	29.8	12	.60	.45	-.49
Adaptive Behavior	23.5	(8.3)	22.9	11	18.1	(9.2)	18.6	12	1.26	.27	-.52
Gross Motor	123.0	(44.3)	118.8	11	96.8	(42.5)	100.6	12	.96	.34	-.41
Fine Motor	47.3	(12.5)	46.2	11	36.8	(19.6)	37.8	12	1.33	.27	-.67
Motor	114.8	(25.3)	112.9	11	91.1	(44.3)	92.9	12	1.54	.23	-.79
Communication	58.5	(16.4)	57.0	11	47.0	(24.5)	48.4	12	.89	.36	-.52
Cognitive	51.1	(22.9)	50.0	11	40.5	(20.1)	41.5	12	.80	.38	-.37
TOTAL RAW	432.7	(122.4)	422.1	11	347.9	(155.3)	357.7	12	1.11	.31	-.53
• Stanford Binet ♦											
Verbal Reasoning	82.7	(15.2)	82.2	10	81.0	(15.5)	81.5	9	.01	.93	-.05
Abstract Visual	88.6	(13.2)	88.9	10	84.2	(13.3)	83.9	9	.57	.46	-.39
Quantitative Reasoning	78.4	(45.0)	75.4	10	76.4	(34.0)	79.8	9	.05	.82	.10
Short-Term Memory	86.6	(14.1)	86.8	10	80.6	(9.9)	80.3	9	1.18	.29	-.46
Composite	85.9	(16.4)	85.5	10	83.0	(12.7)	83.4	9	.09	.77	-.13
• Parenting Stress Index (PSI)											
Child Related	112.5	(22.0)	112.5	10	109.6	(99.2)	109.6	12	.09	.77	.13
Other Related	126.4	(20.2)	125.0	10	118.6	(24.5)	119.7	12	.26	.62	.26
TOTAL	238.9	(37.3)	231.6	10	228.2	(38.2)	229.3	12	.22	.64	.06
• Family Resource Scale Total (FRS)♠	106.3	(16.0)	106.4	8	118.4	(23.9)	118.3	11	1.36	.26	.74
• Family Support Scale (FSS) ♠	26.7	(13.6)	27.2	10	26.9	(10.7)	26.5	12	.03	.87	-.05

♦ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) Adjusted means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

groups; and in spite of full sample analyses suggesting groups were indeed comparable except for "subtle," statistically insignificant disparities on medical variables, that the Early Intervention group has more children who were "sicker" or medically more involved. Indeed, the inclusion of the MSI as a covariate in this year's 12, 24, and 36 month analyses eliminated group differences favoring the control group which had been noted in previous years.

To demonstrate the tremendous implications these medical differences may have for our examination of group differences, preliminary analyses of covariance were conducted with this "flawed" sample of 19 youngsters at 66 months of age. Results are summarized in Table 6.13. Even with MSI as a covariate, this analysis, if legitimate, would suggest that delayed intervention led to significantly better long-term outcomes than early intervention of the type offered. Differences favoring the delayed intervention group either reached or approached significance on all subtests and Total score of the Battelle.

Table 6.13

66-Month Reassessment Measures of Child and Family Functioning for Delayed vs. Early Intervention Groups for SC-IVH Study

	Delayed (No) Intervention				Early Intervention						
Variable	$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj X	n	ANCOVA F	p value	ES♣
• Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal/Social	151.5	(17.6)	151.5	9	116.7	(47.4)	116.7	10	2.43	.14	-2.0
Adaptive Behavior	98.4	(16.8)	97.9	9	76.0	(31.6)	76.5	10	1.88	.19	-1.3
Gross Motor	81.7	(3.5)	84.8	9	53.4	(25.9)	50.6	10	9.12	.01	-9.8
Fine Motor	63.1	(6.4)	63.5	9	38.9	(20.3)	38.6	10	7.00	.02	-3.9
Motor Total	144.8	(8.5)	148.2	9	92.3	(5.4)	89.2	10	8.50	.01	-6.9
Receptive Communication	36.0	(9.1)	35.7	9	23.0	(13.7)	23.3	10	3.38	.09	-1.4
Expressive Communication	44.9	(3.9)	46.5	9	28.7	(18.1)	27.3	10	5.61	.03	-4.9
Communication Total	80.9	(10.0)	82.2	9	51.7	(31.5)	50.6	10	4.72	.05	-3.2
Cognitive	76.1	(17.8)	72.8	9	47.9	(28.7)	50.9	10	2.27	.15	-1.2
TOTAL RAW	551.7	(56.6)	552.6	9	384.6	(178.7)	383.8	10	4.20	.06	-3.0
• Stanford Binet ♦											
Verbal Reasoning	91.1	(10.5)	88.5	8	85.5	(14.0)	89.0	6	.00	.96	.05
Abstract Visual	86.5	(10.0)	88.0	8	72.0	(14.0)	70.0	6	3.20	.10	-1.8
Quantitative Reasoning	95.8	(14.4)	92.3	8	83.0	(21.5)	87.6	6	.10	.76	-.33
Short-Term Memory	87.1	(9.6)	83.8	8	73.8	(13.6)	78.2	6	.32	.58	-.58
Composite	88.1	(10.5)	85.6	8	74.5	(16.9)	77.9	6	.42	.53	-.73
• Parenting Stress Index (PSI)											
Child Related	106.0	(24.9)	110.3	9	104.2	(20.5)	100.3	10	.48	.50	.40
Other Related	124.0	(23.6)	119.8	9	119.6	(27.7)	123.4	10	.05	.82	-.15
TOTAL	230.0	(40.8)	230.1	9	223.8	(46.8)	223.7	10	.06	.82	.16
• Family Resource Scale Total (FRS)♠	110.4	(14.0)	111.7	7	116.0	(19.1)	115.1	10	.09	.77	.24
• Family Support Scale (FSS) ♠	24.3	(12.7)	23.0	9	31.2	(13.5)	32.5	10	1.40	.25	.75

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

♦ Scores were calculated by computing a ratio of developmental score in months/chronological age in months. There were no covariates, and scores here were compared using t-tests rather than ANCOVA F (thus, no Adjusted $\bar{x}$).

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

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The Stanford Binet results were striking as well. Although significant differences were generally not observed, group means again favored the delayed group. The subjects who had a Battelle but not a Binet at these ages were those who were too impaired to even begin a valid Binet assessment. Some of these subjects are multihandicapped, profoundly impaired youngsters still testing in the infancy range on the Battelle. Note that there were four such subjects in the Early group and only one in the delayed group. As this sample grows larger it will be important to look separately at the "Binet eligible" subjects and consider the impact of serious medical complications on subsequent growth and development, regardless of intervention.

Comparison to Other Studies

The results of this ongoing longitudinal study suggest that with this population of medically fragile infant (IVH and/or < 1000 g), early motor intervention of the type and intensity utilized here provided neither short term nor longer term measurable benefits. If anything, the groups who did not participate in intervention between 3 and 12 months looked better than their randomly assigned counterparts on key developmental dimensions.

The results of this study concur with those of three earlier studies of sensorimotor intervention (Goodman et al., 1985; Palmer et al., 1988). While there are important methodological differences between this study and those performed previously, the pattern of results begins to suggest that early intervention which is directed mainly or exclusively toward facilitation of motor development in the first year of life may not be effective for this population. It remains to be seen whether interventions that are more broadly based and are more intensive would be effective in preventing or remediating developmental problems. The study described below addressed this issue.

The largest set of studies other than the one reported in this volume that has examined intervention outcomes to this extent is the Infant Health and Development

Program (Infant Health and Development Program, 1990). A direct comparison between this study and IHDP is difficult because most of the participants in this study would have been excluded from or examined separately in IHDP. Also, the intervention tested in IHDP was much more intensive and costly. Nevertheless, the findings of the projects provide some perspective on the present finding.

In the Infant Health and Development Program, significant group differences were not reported at 12 months or 24 months between control groups and groups receiving much more expensive comprehensive full day, five day programming. At year three, significant differences existed in group means, with the exception of the "lighter" infants (< 1500 g). In the present study, only 8% of the participants weighted more than 1500 g at birth, and approximately half weighed less than 1000 g. The IHDP's lighter and more delayed infants did not benefit significantly from the intervention program which was very intensive. In this context, it is not so surprising that we cannot document earlier intervention benefits in our medically fragile sample. Perhaps even more heroic interventions are needed for this population.

In an effort to replicate some of the logic and methodology employed in the seminal work of the IHDP, we conducted separate analyses of our lower birthweight and higher birthweight infants to see if our study could find a similar trend of bigger, healthier infants showing greater benefit. Again, direct replication was impossible: only 82 of IHDP's 908 participants weighed < 1800 g; only 5 of our 57 third reassessment participants weighed OVER 1800 g.

For our analyses, 24 subjects weighing < 1000 g (extremely low birthweight - ELBW) were examined separately from 23 weighing > 1000 g (very low birthweight - VLBW) for T-test group comparison major outcome variables at 36 months. There were no group differences for either the ELBW or VLBW samples.

Further analyses of this sort will be conducted in the coming year to enhance our understanding of the roll birth variables may have played in this medically fragile, culturally diverse sample that is virtually unique in the intervention literature. In subsequent sections, additional lines of inquiry which have been conducted and/or are underway with this data set will be described.

Preliminary Treatment Compliance Analyses

Parent interviews were completed in 1990-91 as part of an additional treatment verification process. Although much of this data still needs to be quantified, initial review of interview data and interventionist records were utilized to allow for preliminary examination of treatment compliance as a factor in these results.

The project director and research coordinator independently assigned subjects to one of four treatment categories based on their participation: (1) subjects assigned to early intervention who completed both 12 and 24 months with good compliance (Early/Comply); (2) subjects assigned to early intervention who withdrew or failed to comply with both parts (Early/Non-comply); (3) subjects assigned to Delayed who participated fully once they were invited to be in intervention in Year 2 (Delayed/ Comply); and (4) subjects assigned to Delayed who dropped out prematurely or failed to participate meaningfully (Delayed/Non-comply). Independent raters agreed on 61 of 64 category assignments, then agreed on the assignment of three whose status was first ambiguous.

A 2 x 2 ANOVA was utilized to compare the four groups' developmental and family outcomes at two and three year re-assessments (Year 1 was omitted since "Delayed" subjects had not yet had an opportunity to become compliers vs. non-compliers at this assessment). There were no significant differences between groups or between compliers and noncompliers, and there were no significant interactions on any of the variables. Thus, there were no measurable differences among assignment or compliance groups.

A second set of analyses selected only "early intervention" subjects in "comply" group and compared them to "delayed" intervention subjects regardless of compliance status. For this analysis, seven subjects were removed, regardless of group based on their profound disabilities and sensory impairments making their potential for intervention responsiveness different from that of the remaining sample. When this "clean" group of consistently participating early intervention subjects was compared to delayed subjects, there were no significant differences on developmental or family measures. The means of the early intervention subjects, however, were consistently lower than those of delayed intervention subjects on developmental measures.

These results suggest that the early delivery of this type and intensity of treatment to this population did not provide a measurable advantage over delayed intervention. Furthermore, subjects who self-selected to become non-participants or very infrequent participants for whatever reasons (at least some of these subjects felt they did not need intervention because problems were not evident) did not progress differently than subjects in either delayed or early intervention.

Predictors of Developmental Progress

Since age of start for intervention and extent of participation in intervention did not significantly predict developmental progress, we recently sought to answer the question, "What DID?". Factors commonly implicated in the literature as correlates of development were entered into a stepwise multiple regression to see which would predict child development as measured on the MCDI at 12 month, 24 month, and 36 month adjusted ages. Mother Education, Income, Race, Medical Severity Index (MSI) score, Average Appropriateness score from 12 month PCIS (Parent-Child Interaction) and intervention group status were entered without pre-specified order to determine their power to contribute to the variance in development, as measured by the MCDI and the Battelle.

At 12 months Mother Education was the only significant predictor of child development on the Battelle ($T = 3.03$, $p < .004$), though MSI approached significance ($p < .09$). At 24 month and 36 month re-assessments, only Maternal Education was a significant predictor of MCDI or Battelle. The problems inherent in using the MCDI (parent report) as the developmental outcome seem less significant in light of the replication of the finding using the Battelle scale. Table 6.14 summarizes the correlations between key medical/demographic variables and developmental scores at 12, 24, and 36 months. Both Medical Severity Index (MSI) and maternal education correlated with development at 12 months, while only maternal education predicted development at 24 and 36 month intervals.

Table 6.14

Correlations of Key Demographic and Medical Variables with Developmental Scores in First 36 months (for all subjects)

	12 Months		24 Months		36 Months	
Variable	Battelle Total	MCDI GD	Battelle Total	MCDI GD	Battelle Total	MCDI GD
Income	.13	.05	.07	.07	.20	.23
Mother Education	.36[b]	.38[b]	.32[a]	.26[a]	.42[a]	.41[b]
Race	-.03	.01	.01	-.02	-.03	.00
Group (Delayed vs. Early)	-.11	-.10	-.12	-.07	-.14	-.11
Parent Interest (PCIS Approp)	-.11	.01	.01	-.31[a]	-.13	.04
Medical Severity	-.32[b]	-.24	-.23	-.18	-.21	-.11

[a] = $p < .05$
[b] = $p < .01$
[c] = $p < .001$

In the coming year, more of this kind of analysis will be employed in an effort to learn more from this very rich data set.

Related Studies in this Data Set

In addition to core research presented and discussed, this longitudinal data set with an understudied population has provided opportunities for ancillary studies at various stages of progress. Lines of research and status of each are briefly presented below:

A) Relationship of Parent-Infant Interaction and Parenting Stress. MUSC Psychology Intern Beth Onufrak has worked with us this year in examining this relationship in two year-olds. Her preliminary study, which demonstrated a positive correlation between PSI child stress and PCIS Appropriateness scale won an annual prize for best Intern paper (of 14 submitted for blind review). She is developing this into a Dissertation study and negotiating to include data from SLC-IVH, and perhaps Columbia sites.

B) ***Relationship Between Parent-Infant Interaction and Developmental Progress***. For several years we have explored the relationship between Parent-child interaction and development in this understudied sample of medically fragile, culturally diverse infants. At some levels this is basic research, though preliminary findings of different interaction-development correlations for Early vs. Delayed Intervention subjects have us intrigued. A preliminary publication launched this research (Wilfong, Saylor, & Elksnin, 1991), but final analysis for publication is still "on hold" awaiting coding of last 11 tapes for this site. Two paper presentations have been vehicles for preliminary dissemination and discussion (Casto & Saylor, 1990; Saylor, 1991).

C) ***Psychometric Issues***. Because of its longitudinal, multimethod design, this study has provided a wealth of data about measures of preschool function in dire need of further empirical scrutiny. Concurrent and predictive validity of the MCDI and Battelle have been examined, along with the utility of the Stanford Binet, Fourth Edition. Recent presentations on these issues have included Ashmore, Saylor, Foster, & Casto, 1991 and Saylor, 1992. A related manuscript about MCDI validity is now in press in Journal of Pediatric Psychology (Shoemaker, Saylor & Eriksen, in press). A manuscript on concurrence of the Binet, Battelle, and PLS has been submitted and reviewed twice. This year we will revise and resubmit. A manuscript on further MCDI studies will be submitted this year.

Conclusions

It is clear from the analyses of the demographic data of the overall group that random assignment worked well and created groups which were comparable with respect to relevant characteristics of children and families. Statistically, the groups were balanced on all demographic and medical characteristics except the proportion of males in the groups. Mild differences on medical variables with potential clinical significance were dealt with using a Medical Severity Index as a covariate. In addition, the groups did not differ on any of the pretest child or family measures.

The results of the 12 month re-assessment indicate that after 12 months of intensive motor oriented intervention, the early intervention group demonstrated poorer developmental progress. The early intervention group performed more poorly on the BDI; family measures did not indicate any effects of the intervention. The results of the analyses of the second and third re-assessment indicated no significant differences between the groups. Preliminary examination of 54 month and 66 month re-assessments suggests a continued trend in this direction. This finding is consistent with other studies of early sensorimotor intervention with medically fragile and neurologically "at risk" populations, and complimented by studies of much more ambitious intervention. Additional studies in the coming year will focus on explanation and clarification of these findings.

COLUMBUS MEDICALLY FRAGILE PROJECT

Project #7

COMPARISON: Infants with Bronchopulmonary Dysplasia (BPD) or neurologic damage--Coordinated NICU transition services beginning prior to hospital discharge vs. traditional NICU referral and follow-up.

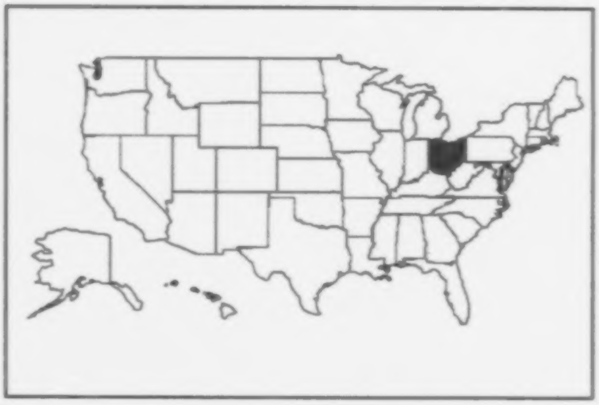
LOCAL CONTACT PERSONS: Daniel Coury, Columbus Children's Hospital

EIRI COORDINATOR: Linda Goetze

LOCATION: Columbus, Ohio

DATE OF REPORT: 10-1-1992

Rationale for the Study



The type of early intervention program used in the Columbus Medically Fragile Project (Columbus/MF) flows from the theoretical position set forth by Urie Bronfennbrenner (1979) in The Ecology of Human Development. Bronfennbrenner views the environment as a set of nested structures, each inside the next. The basic unit is the setting, such as the family, which includes the developing person. The relationships between settings form the next level of influence upon development. Bronfennbrenner argues that the relationships between settings can play as decisive a role in development as the events within a given setting. Consequently, this project endeavors to facilitate the family's ability to meet the infant's needs and impact on the transition between the hospital and the community, since both can greatly influence the infant's development. Bronfennbrenner also contends that the practices of society at large can profoundly influence the developing person. The importance of this level of influence is exemplified by P.L. 99-457, the public law which encourages states to provide appropriate early intervention services to all infants and toddlers with disabilities.

As the Bronfennbrenner model suggests, the families of medically fragile infants vary along several major dimensions: the functioning of the family, which includes and is affected by the status of the infant; the influence of the hospital; the effects of the practices of society at large; and the community resources available to the family. Following this model, the Columbus project attempted to enhance the family's functioning, the status of the infant, and the community's ability to meet the family's and infant's needs. The project also attempts to influence societal attitudes and practices as regards the care and development of the medically fragile infant and his/her family. Figure 7.1 illustrates the model used to design services for children and families participating in this project.

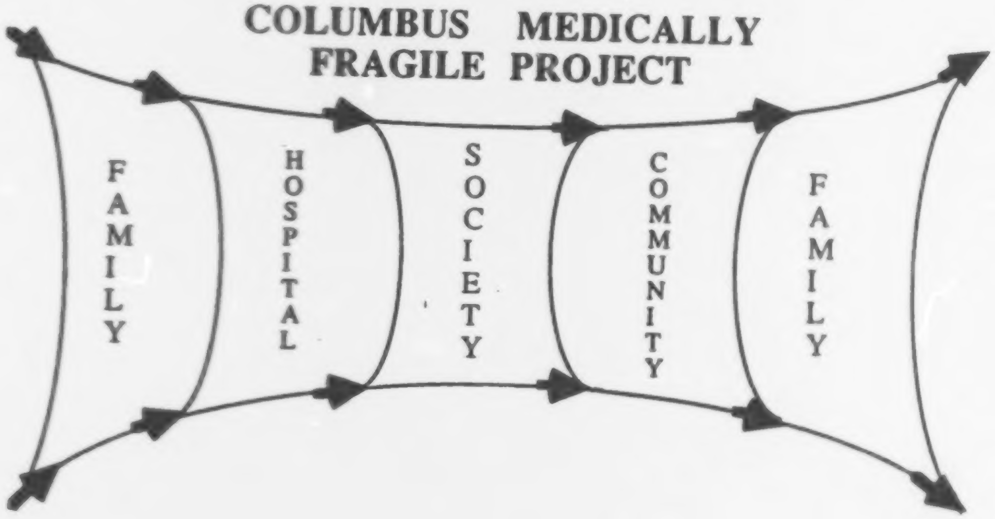


Figure 7.1: Path of the Columbus/MF Project Model facilitating optimal family and infant functioning from the hospital to the community and home.

The project was also influenced by the theoretical models of adult education (Falvo, 1985; Knowles, 1980, 1984) and social support (House & Kahn, 1985; Madge & Marmot, 1987; Thorts, 1982; Veiel, 1985), with the goal of providing services to aid the transition of families and infants to local professionals.

The Columbus/MF program serves as a model for specialized care and support to the home and community following hospital discharge of the infant, rather than basing this support in the tertiary care hospital. The medically fragile infant is at established risk for developmental delays due to serious long-term medical and nutrition problems, lack of coordinated follow-up and intervention services in the local area, and lack of specialized training for local health, social service, and educational intervention personnel. There is a need to determine whether the developmental outcome of medically fragile infants and the functioning of their families can be improved through coordinated and comprehensive services to ease their transition from the hospital to their local community.

Review of Related Research

The literature on the efficacy of early intervention services for medically-fragile infants is limited. The following criteria were used in locating studies for this review: Subjects had to be medically-fragile or low-birth-weight infants receiving intervention at zero to three years of age, and the experimental design had to involve a comparison of different treatment intensities. Seven studies were found that met these criteria. Table 7.1 presents these studies and summarizes comparison variables, study quality, duration of program, child-risk factor, and effect size or findings of each of the seven studies.

Table 7.1

Studies Which Examined Early Intervention for Low Birthweight or Medically Involved Infants

Reference	Comparison	Study Quality	Duration of Program	Child Risk Factor	Effect Size
Dawson, Robinson, Butterfield, van Doorninck, Gaensbauer, & Harmon (1990)	Weekly home visits and parent group meetings vs. weekly home visits vs. routine maternity and pediatric are.	fair	16 months	Pregnant mothers expecting 1st or 2nd child	*
The Infant Health and Development Program (1990)	Home visits, child development center, parent group meetings, and pediatric follow-ups vs. just pediatric follow-ups.	good	36 months	Low Birthweight, premature	.17
Piper, Kunos, Willis, Mazer, Ramsay, & Silver (1986)	Physical therapy treatment and parent-training program vs. regular neonatal follow-up program and referrals to physical therapists.	good	9 months	At-risk for neurologic sequelae	+
Ramey & Campbell (1987	Preschool: Developmental preschool vs. iron-fortified formula.	good	3 years	High-risk families	@
Raugh, Achenbach, Nurcombe, Howell, & Feti (1988)	Special NICU care and parent training vs. traditional NICU care for control group and no services for normal birthweight comparison group.	good	3 months	Low Birthweight, premature	.38
Resnick, Eyler, Nelson, Eitzman, Bucciarelli (1987)	Special care in NICU, parent training and home visits vs. traditional care in NICU and referrals to outside services.	poor	2 years	Low Birthweight	.39
Ross (1984)	Home visits vs. no services.	good	1 year	NICU, low SES	.43

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* Mother-Infant interaction was better at 4 months in home-visited families than in controls, especially with teenage and Hispanic mothers and other subgroups.

+ No Statistically significant differences found between experimental and control groups.

@ Preschool intervention exerts an influence on intelligence and school success in the first 2 years of public school.

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The comparisons in the reviewed studies have some components similar to the ones in this study, such as home visits, developmental programs, physical therapy, and referrals to outside services. Unlike the Columbus Medically Fragile (MF) Study, None of the studies combined all these components. Ratings of study quality were based on evaluations of experimental design and internal validity. The rating scale ranged from one to five, one being good, three being fair, and five being poor. Five of the seven studies were rated good on study quality (The Infant Health and Development Program, 1990; Piper et al., 1986; Ramey & Campbell, 1987; Rauh et al., 1988; and Ross, 1984). Of the other two, one was rated fair (Dawson et al., 1990), and one was rated poor (Resnick et al., 1987). The duration of the programs in the studies ranged from 3 months to 3 years.

The area of child-risk factor is where the reviewed studies differ most from the present study, which selected subjects based on neurologic or pulmonary difficulties. Only one study (Piper et al., 1986) chose subjects by the criteria of being medically fragile. Two studies (The Infant Health and Development Program, 1990; Rauh et al., 1988) excluded infants with severe medical difficulties. The rest of the studies most likely had some medically fragile subjects, but they were combined with other subjects, either of low birth weight or environmentally at risk (Dawson et al., 1990; Ramey & Campbell, 1987; Resnick et al., 1987; and Ross, 1984). The studies with low-birth-weight or environmentally-at-risk subjects showed moderate effects of the experimental interventions. Piper et al. (1986) found no significant differences between experimental and control groups with medically-fragile subjects. In a review of the early intervention literature, Dunst, Snyder, and Mankinen (1989), found that more severe children made smaller gains in development than at-risk or mildly disabled children. Since the current study involves medically fragile subjects similar to the sample in the Piper et al. 1986 study, effects similar to the Piper et al. (1986) study might be expected.

Overview of Study

Two intensities of service to medically fragile infants and their families are investigated. The effects of a coordinated and comprehensive system of early intervention services initiated prior to discharge from the NICU are compared with the effects of services routinely provided by the hospital through medical check-ups and referrals following discharge. Infants in both the high and low-intensity intervention received NICU follow-up and referral. This follow-up included regular assessment, pediatrician check-ups and/evaluations in the NICU clinic based in Columbus Children's Hospital. Referrals were made for all infants and their families to health and other service providers in their local communities. These services are provided to all NICU graduates of the hospital. In addition, the high-intensity group of infants received comprehensive, coordinated services from a transition team to facilitate their transition from a centralized source (the Columbus Children's Hospital, CCH), to regionalized sources (agencies within local communities). The randomly assigned comparison group of children, the low-intensity group, received only the limited services previously available to CCH NICU graduates as described above and by Koops et al. (1984).

Methods

Subjects

The Columbus project enrolled 52 subjects between October 1, 1988, and March 12, 1990. A description of the recruitment and assignment procedures and the characteristics of study participants follows.

Recruitment. Medically fragile infants who were hospitalized in the Columbus Children's Hospital Intensive Care Unit were eligible to participate in the study if they were diagnosed with moderate to severe BPD and had a need for oxygen therapy and/or two or more pulmonary medications upon hospital discharge. Infants with neurologic conditions (e.g., severe [Grade IV] perinatal intraventricular hemorrhage, hydrocephalus, microcephaly), requiring specialized equipment (e.g., feeding pumps, suction, and/or aerosol equipment), were also eligible.

Eligible infants were identified for inclusion in the study when their weight reached 1500 g (approximately one month before discharge). At that time, the parents were contacted by the project's clinical nurse specialist. The nurse explained to the parents the nature of the study, requested their participation, and if parents were willing, obtained informed consent. If parents decided not to participate in the study, their infant received routine medical and developmental follow-up through the Neonatal Follow-up Clinic, and, if necessary, was referred to local agencies for limited health, occupational therapy, physical therapy, and early intervention services. Parents were informed of their child's group assignment after they completed the informed consent procedure.

Assignment to groups. Following enrollment, the infants were randomly assigned to either the high- or low-intensity groups after being stratified by their primary diagnosis of BPD or neurologic damage. The BPD and neurologic groups were each further stratified into groups of more or less severe illness based on the medical severity index developed by the hospital staff. The severity index allowed a physician to rate the infants on a scale of 0-5, with 5 being the most severe or abnormal rating on nine variables thought to be related to medical outcome. The variables included the infant's degree of technology dependence, oxygen dependence, respiratory status, age at discharge, neurologic status, ultrasound/CT findings, head circumference, feeding status, and sensory impairment. A total severity score ranging from 3 to 45 points was obtained. Infants receiving a score of 18 and below were determined to be "low risk," and those receiving a score of 19 and above were considered "high risk." Following both stratification processes, group assignments were randomly made by the EIRI site coordinator, who was unknown to the infants and their families.

Subject Attrition. Table 7.2 presents data on attrition for 6-, 12-, 18-, and 24-month posttests. The reasons for attrition and total sample analyzed for this report at each posttest are presented. At 6 months posttest, 6 infants were hospitalized so that assessments could not take place for these infants.

Table 7.2

Subject Attrition at Infant Chronological Age at 6, 12, and 18 Months

	Low Intensity	High Intensity
Enrollment	26	26
Infant deaths	1	2
Hospitalized at 6 months	4	2
Left project	1	1
TOTAL TESTED AT 6-MONTH POSTTEST	20	21
Enrollment	26	26
Infant deaths	1	3
Left project	2	2
TOTAL TESTED AT 12-MONTH POSTTEST	23	21
Enrollment	26	26
Infant deaths	1	3
Left project	3	2
TOTAL TESTED AT 18-MONTH POSTTEST	22	21
Enrollment	26	26
Infant deaths	1	3
Left project	2	2
TOTAL TESTED AT 24-MONTH POSTTEST	23	21

An analysis of pretest demographic data and measures of child and family functioning indicated no statistically significant differences between the subjects who remained in the study and those lost to attrition on any of the measures. Families of subjects lost to attrition had lower total household income, however, this difference was not statistically significant. To minimize attrition, both the onsite coordinator and the EIRI coordinator maintained updated telephone numbers and addresses of the participants. Data were collected every six months for infants in both groups until the infant reached 24 months age corrected for prematurity (CCA) and once a year thereafter. Infants and families in the high-intensity group were in frequent personal and telephone contact with study personnel as intervention services were delivered. By definition, infants in the low-intensity group did not meet with study personnel between assessments; however, the study was successful in assessing infants in both groups on time. If needed, study personnel arranged for transportation services to assist families in meeting scheduled assessment appointments.

Demographic characteristics. Information was gathered by questionnaires regarding family income, ethnic background, parent occupation, number of siblings, and primary caretaking responsibilities of the participating families. Results of the parent surveys indicated that 36% of the infants were from families living in Columbus, Ohio, and its immediately surrounding area. The remaining 64% resided in towns and rural areas of central and southeastern Ohio. The total sample was composed of 81% Caucasian infants and 19% non-Caucasian infants. Seventy-seven percent of the infants were from two-parent families, and 98% were from homes where English was the primary language spoken. Further information about the demographic characteristics of the infants and families in each group will be presented in the Results and Discussion section.

Intervention Programs

The Columbus/MF Project compared a high-intensity intervention program to a low-intensity intervention program. Children in both groups received medical follow-up after their initial discharge from the NICU. The high-intensity intervention group also received coordinated and comprehensive services designed to improve their health and developmental outcomes, and to facilitate their transition from the tertiary hospital to community-based early intervention programs.

High-intensity intervention program. Intervention services provided to the high-intensity intervention group consisted of pre-discharge hospital visits, medical follow-up clinic services, and coordinated multidisciplinary office and home-based early intervention services. The intervention began with two to three weekly hospital-based visits with families approximately one month prior to the infant's discharge from the NICU. The hospital-based visits, which were initiated by the project's clinical nurse specialist and/or social worker, provided an opportunity for families to establish a support system with ties to both the hospital and their home communities, and to allow the project to assist families in planning for their infant's home care needs prior to discharge. These services were designed to help families identify and initiate contacts with service providers in their local areas. The transition team which provided the high intensity services included a clinical nurse specialist, with a background in developmental disabilities and parent/child interaction, and the director, with an interdisciplinary background in early intervention. They provided services on a full-time basis. The team also included a neonatologist, an interdisciplinary developmental consultant with a background in occupational therapy and special education, and a social worker, all of whom worked on the team part-time. All of the time spent by these specialists was in addition to the traditional referral and follow-up services provided by other hospital staff to all NICU infants and their families.

The transition team had several roles. First, they worked with NICU and families in planning discharge from the hospital and in follow-up with local health and developmental services. Second, they assisted families and local service providers in developing and carrying out the Individualized Family Service Plan (IFSP). They also made regular home visits with the family and infant after discharge from the hospital.

Because medical concerns took a primary role in the first weeks after discharge, local services often initially included 24-hour home nursing care, rental or purchase of durable medical equipment such as supplemental oxygen, ventilators, or positioning and feeding equipment. As the infants' medical conditions stabilized in the home settings, additional services included public health, social service, mental health, education, or occupational, physical, and speech therapy.

After hospital discharge, infants received regular medical supervision and developmental evaluation through Columbus Children's Hospital High-Risk Neonatal Follow-up Clinic. The first medical follow-up visit occurred two weeks post-discharge. Additional visits were scheduled for 6, 12, 18, and 24 months of age (all ages referenced in this report prior to 36 months are corrected for prematurity), and yearly thereafter. The clinic was staffed by a neonatologist, a social worker, a nurse coordinator, and an occupational therapist who provided health monitoring and developmental evaluation. Full ancillary services (radiology, drug level monitoring, pharmacy, respiratory therapy, ophthalmology, and audiology) were available in the hospital.

Regular home visits were initiated following hospital discharge and continued for about 12 months. The Columbus/MF project's clinical nurse specialist and developmental consultant attended the home visits with local service providers on at least a monthly basis. Whether or not these collaborative home visits were interdisciplinary depended on the concerns surrounding the infant and the family needs. Participants in these collaborative home visits included at least one member of the Columbus/MF project staff, one local service provider, the family (or at least the primary caregiver), and the infant. Post NICU discharge transition team services focused on IFSP (Individualized Family Service Plan) development and implementation and developing home visit collaboration.

Within 45 days from discharge, the developmental consultant and nurse from the transition team arranged an IFSP meeting with the family and identified local service providers to implement goals of the IFSP. A service coordinator was designated as were providers and methods of service delivery. Nursing services were provided using a community health or home health model where a nurse provides intermittent health assessments and family education with the goal of maintaining and improving the infant's health. Nursing services were provided in a home-based setting, usually for four to twenty-four hours a day. The child's IFSP generally included planning for twelve month outcomes in child health, child development and family functioning.

If the child left the hospital with home oxygen therapy or had experienced a Grade III or IV intracranial hemorrhage the transition team recommended multidisciplinary developmental intervention for the family. This component of the program was influenced by a study of the efficacy of such programs for these infants (Sparling, 1989). This component was broadly based in that intervention focused on a range of developmental areas, not just those in which the child showed a deficit. A certified professional in early intervention provided parent training which assisted parents in methods to improve infant's motors skills. This intervention also trained parents in methods of integrating the cognitive, social, communication and adaptive development of their children into play and daily living activities.

Other transition team services varied by community and family. Local community providers and families, assisted by a member of the transition team, developed other services for infants. Single discipline therapy was one alternative, with a therapist focusing on motor or communication skills by completing exercises with the infant and teaching parents to do these therapies as well.

Regular home visits were scheduled by the transition team nurse and developmental consultant in order to gradually shift responsibility for service to local providers and parents. The basic structure of these visits was to update, plan, practice and integrate service into the family routine. Update incorporated discussions with families of assessment results and implications, intervention routines as integrated into family activities, review of program, records, etc.

Planning involved reviewing parent education needs and providing demonstrations, reading materials, videotapes or other materials to assist families with the intervention being implemented to meet identified needs. Health related issues were also reviewed and goals and routines established for maintaining or improving child growth and nutrition. Developmental planning was modeled on the Hawaii Early Learning Profile (HELP) (Furono et al., 1985). This model charts goals incorporating six developmental areas: gross motor, fine motor, social, language, cognitive and self help. It provides charts of developmental milestones which are integrated into an activity-based developmental approach to achieving family and child goals.

During practice the intervention team practices the activities with the child. The team can then discuss and decide the appropriateness of the routine for achieving the designated goal. A calendar was left with families outlining activities, directions, and family strategies for achieving the goals for that month. Families were asked to practice three different activities a day and spend a minimum of one to five minutes on each activity. In order to integrate into the family's routine the family was asked to complete a calendar tracking how often, how many minutes, and when and where the activity was practiced.

Local service providers were also encouraged to assist families in locating and using additional community services such as respite care. The project gradually shifted responsibility from the resource team to the communities. The timing of this shift was individualized to meet the family's needs and the ability of the local service providers to take a more direct and independent role in working with this special population. The ultimate goal of the project was to transfer full responsibility for the care of the medically fragile infant to local service providers (physicians, public health nurses, early educators, etc.). It was anticipated that these agencies would continue to provide necessary services after the children no longer received transition services from this project.

Low-intensity intervention program. Infants in the low-intensity intervention group received the services that were available to all graduates of the NICU. These services included the same medical and developmental follow-up services of the High-Risk Neonatal Follow-up Clinic that infants in the high-intensity intervention group received. However, subjects in the low-intensity intervention group did not receive the coordinated transition services or the office and home-based early intervention services available to the high-intensity intervention group. Infants in the low-intensity intervention group who were found to be delayed, at-risk for delay, or in need of community services by the follow-up clinic, were referred to community agencies by the hospital follow-up clinic. These agencies were notified of the referral. These referral agencies were utilized inconsistently at best. Documentation of how often infants in the delayed group accessed referral services is discussed in the treatment verification section that follows.

Treatment Verification

Treatment verification procedures were carried out to ensure that treatment occurred in accordance with the proposed intervention program plan. It consisted of data collected on the child, family, and intervention program. Treatment verification data on children in the high-intensity intervention group included data on the development of the Individualized Family Service Plan (IFSP), a log of individual services provided by the transition team staff who provided home and office services, and additional services data for Physical/Occupational Therapy (PT/OT), early intervention, and public health nursing services. Additional services data and information on IFSPs was also obtained for infants and families in the low intensity intervention. Data on length and number of transition team visits were kept by the transition team nurse and multidisciplinary development specialists who provided these services.

The transition team nurse and developmental consultant worked toward arranging IFSP meetings for the families in the more intensive group. They contacted local service providers and worked to bring them into the IFSP process. The results of a survey of families who participated in the study at the 18-month posttest, regarding the presence or absence of IFSPs, shows that 12 (60%) of the high intensity group families reported that they had an IFSP in place, while 4 (19%) of the families in the low intensity intervention reported having an IFSP.

Table 7.3 shows the mean number of transition team service hours that the high-intensity group received which were not provided to the low intensity group. These services began at the time the child was enrolled in the intervention. Services peaked by 6 months and were gradually phased out with most services provided by 12 months CCA. In addition, the table shows the total number of service hours that children in the transitional model received either through home- or center-based service. All transition group infants and their families received services from the nurse and social worker.

Table 7.3

Average Number of Transition Team Service Hours Per Infant from Enrollment to 18 Months CCA*

	High Intensity			
	$\bar{x}$	(SD)	n	Total
Hours of transition team nursing at office	1.6	(1.5)	21	34
Hours of transition team nursing at home	10.0	(3.1)	21	210
Hours of transition team interdisciplinary child development services at office	3.2	(3.7)	21	67
Hours of transition team interdisciplinary child development services at home	10.0	(5.6)	21	209

** $\bar{x}$ for the Low intensity infants is zero for all transition services.*

** CCA refers to the child's age adjusted for prematurity*

The interdisciplinary child development services, combining home- and center-based figures, averaged about 13.2 hours per child during the transition period. The interdisciplinary services included parent training through demonstration with the infant. The transition team interdisciplinary consultant also provided services to the family to improve the child's motor skills and to help the family integrate the family's daily living situations into the infant's cognitive, communication, adaptive, and social development. The interdisciplinary services were provided by a professional certified in early intervention who also had a background in occupational therapy. Nursing services averaged nearly 12 hours per child, with most of those services provided in the home. Nursing services began prior to discharge from the hospital and focused on developing a plan to assist the family in the transition to their community. The emphasis was on developing local health care, such as pediatrician and public health nursing services and obtaining necessary medical equipment. Children in the high intensity intervention received, on average, 26.5 hours of home and office nursing service during the first 12 months after being released from the hospital.

The transition team home visit services were scheduled as frequently as once per month during the first six months. They gradually decreased during the second six months of intervention; the transition to local services was completed around the 12-month posttest.

Information about additional services received by the child was collected from parents of children in both groups. Data on additional services per child from the time of enrollment to the time of the 24-month posttest are presented in Table 7.4. These service hours are in addition to those provided to high intensity infants that were outlined earlier in Table 7.3. The children in the more intensive intervention received significantly more early intervention services than the children who were assigned to the less intensive group at 12 months CCA. This is an important confirmation of treatment differences. The more intensive intervention was designed to transition medically fragile NICU infants into services in their local communities. While the differences for physical/occupational therapy (PT/OT) and public health nursing are small, the difference in early intervention services between the groups is quite large and statistically significant with a p-value = .02. As shown by the percentage of children in each group who received services, nearly twice as many of the infants in the more intensive intervention received early intervention services when compared with the infants in the less intensive group.

Table 7.4

Additional Services Hours

	Low Intensity					High Intensity							
	% of children who received service	Hours of Service				% of children who received service	Hours of Service						
Variable		$\bar{x}$	(SD)	n	Total		$\bar{x}$	(SD)	n	Total	T Value	p Value	ES^
12-MONTH CCA													
Early Intervention	44	10.5	(19.5)	23	242	81	57.7	(83.0)	21	1,211	2.54	.02	2.42
PT/OT	13	15.3	(16.2)	23	353	71	14.7	(13.5)	21	309	.14	.89	-.04
Public Health Nursing	78	12.0	(19.3)	23	275	91	15.6	(17.4)	21	327	.65	.52	.19
24-MONTHS CCA													
Early Intervention	48	21.7	(38.1)	23	499	62	54.3	(93.9)	21	1,140	-1.50	.15	.86
PT/OT	52	11.9	(15.5)	23	274	62	11.9	(13.3)	21	250	-.01	.99	0

^ Effect size is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ scores divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of ES).

* CCA refers to the child's age adjusted for prematurity.

Hours of service, as outlined in Table 7.4, indicates that five times more early intervention service hours were provided to the transition team infants than to the subjects in the traditional services group at the time of the 12-month reassessment. At 24 months, the more intensive subjects continued to receive 2½ times the number of early intervention service hours as compared with the less intensive subjects. In that one of the primary purposes of the transition team was to assist families in obtaining community-based early intervention services, these data confirm that that objective was reached. It also suggests that the difference in hours continued after the transition team services ended although that difference is decreasing.

Data about the family included an estimate of the quality of parent involvement by CCH project staff, a parent satisfaction questionnaire completed by parents at the 12-month posttest, and an estimate of how well the parents felt they were able to integrate the infant's programs into their daily routine were also collected at posttest. As discussed earlier in the description of the high intensity intervention, parents in the high intensity intervention were asked to spend 3 to 15 minutes per day in developmental activities with their child. Data were not collected to verify that parents complied with this goal. Parents were asked to rate their child's program on a scale of 1-4, with 1 reflecting poor ratings and 4 excellent ratings of program service. Mean scores ranged from 3.5 - 3.9. There were no differences between groups in terms of parent satisfaction with their child's progress or program. As almost all families received some form of PT/OT, nursing, or early intervention services, the parents' perception of how well they were able to integrate the program activities into their family routines was gathered and measured on a scale of 1-3, with 1 being the most able. There was no significant difference between the groups on the integration variable at the 12-month posttest.

EIRI staff also maintained weekly telephone contact with the project staff, conducted three yearly site visits, and conducted an annual onsite review of the project. A site review of the Columbus project was conducted August 23-24, 1990. The purpose of this review was to collect information about the nature and quality of intervention services provided to the high- and low-intensity intervention groups, and to verify that the research conducted by EIRI was being implemented as intended. ***The Guide for Site Reviews of EIRI Research Sites*** was used to evaluate program components of the project, and included a general review of program philosophy, subject records and assessment procedures, observations of staff-child and staff-parent interactions, and a review of administration and management procedures.

The overall results of the Site Review were very positive. Comprehensive and coordinated services were provided to the early intervention group, and data were managed in an exemplary manner. Furthermore, a review of 12-month posttest data by the site review team indicated that there were substantial differences in the number and intensity of interventions received by each group. A full report of the site review is available from the site coordinator.

Cost of Alternative Interventions

The cost of delivering the intervention programs described above was determined using the ingredient approach (Levin, 1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we had no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1991). In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

The cost of early versus later intervention was determined by analyzing costs for both program alternatives on two levels (see Table 7.5). The first level consisted of the hospital-based transition team which coordinated services for the child on the local level following release from the hospital. The second consisted of the costs associated with the local agencies providing direct additional services to the children and families in the research study.

Transition team resources for children in both groups (see Table 7.5) included direct service and administrative personnel, occupancy, equipment, materials and

Table 7.5

Columbus Medically Fragile Project Costs (1990 Dollars)

	Low Intensity	High Intensity
Agency Resources - Transition Team		
Direct Services	$ 265	$ 2,900
Administration	203	2,231
Occupancy	51	562
Equipment	12	133
Transportation	31	338
Materials/Supplies	16	181
Miscellaneous	8	91
SUBTOTAL	$ 586	$ 6,436
Additional Services - Local Agencies		
Public Health Nurse	$ 861	$ 1,121
Early Intervention Program	389	2,133
Physical/Occupational Therapy	1,148	1,102
Speech Therapy	48	22
SUBTOTAL	$2,446	$ 4,378
GRAND TOTAL	***$3,032***	***$10,814***

supplies, travel, and miscellaneous expenses. Personnel resources allocated to children in the two groups differed according to the actual amount of time spent. the allocation of resources to the control group is explained in more detail below. Direct service personnel costs include salaries and benefits for the pediatrician, nurse, social worker, parent-infant educator, and an occupational therapist. Salary and benefits were also calculated according to the percentage of FTE worked on the project for program administrative personnel: project director, secretarial and support staff, and general hospital administration. The percentage of time devoted by the staff to the demands of the research were, of course, excluded from the costs of the service project. Hospital administrative costs for direct service employees were based on the hospital's indirect rate for administration (.22 of direct expenses). Occupancy charges are based on the 1989 rate per square foot for space used by the program, including plant operation, housekeeping, maintenance, repairs, and insurance. The project used 328 square feet at $12.86 per square foot for space,

$2.43 per square foot for plant operation, $7.21 per square foot for housekeeping, $14.73 per square foot for maintenance repairs and insurance, for a total of $37.23 per square foot. Equipment included office equipment and furniture used for 3.0 FTEs. Market replacement values were ascertained for each item and an annualization factor was applied to arrive at an annual cost accounting for interest and depreciation. Travel expenditures were based on actual mileage. The cost of materials and supplies and miscellaneous expenses were based on the project's annual expenditure on these items.

Transition team personnel costs for children in the low intensity group were minimal; the nurse spent time recruiting, testing, and collecting child and family medical data, chart keeping, etc.; the social worker set up appointments and coordinated the OT clinic where infant assessment and follow-up were done; the occupational therapist tested the children; and the pediatrician received visits from each child born in the NICU. All children born in the NICU, whether part of this study or not, receive these services. These are all costs associated with the direct services provided by the project. For each of these activities, the actual amount of time spent and the associated cost of the time was determined. This time cost is the direct service cost for the low-intensity group. To determine the proportion of direct service cost to allocate to the low intensity vs. high intensity cost, the total direct service cost for the two groups was calculated. The low-intensity group direct service cost portion of this total direct service cost was 9.4%. Thus, this proportion was used as the best estimate of the proportion of indirect service resources used by the low-intensity group.

As previously mentioned, cost analyses were also conducted to determine the cost per child in both groups for services received in the community. Here, the emphasis was on services which the child or family received as a direct result of the transition team intervention and were services related to the child's condition or disability. Thus, social services such as WIC or subsidized housing, or social worker services were excluded because these were not related to the child's disability. Also excluded were individual physician fees, private home nursing care and equipment costs, and the cost of the NICU and readmissions to the hospital. These costs were a function of the severity of the child's condition and were services the child/family would have received regardless of the efforts of the transition team.

From the additional services form, it was obvious that the transition team referred children and families to three main services: public health nursing (PHN), early intervention programs (EI), physical and occupational therapists (PT/OT), and speech therapy (ST). The costs for PHN, EI, PT/OT, and ST were determined by contacting representative agencies providing these services to young children throughout Ohio, Indiana, and Pennsylvania to determine an average cost. In the case of the public health nursing, cost information was generally available in cost per visit; thus, this is the unit used for PHN in the analysis. PHN cost per visit did not significantly differ between urban and rural locations due to the higher cost of transportation in the rural setting which offset the potentially higher personnel costs in urban settings. For PT/OT, ST, and EI, cost figures were generally available in cost per hour and this is the unit used in the present analysis. Costs for PT/OT, ST, and EI did vary from urban to rural settings; the estimate used is an average of urban and rural figures obtained because children in the study were approximately balanced between urban and rural settings. Cost estimates used for the analysis were: (1) public health nurse at $72 per visit, (2) early intervention services at $37 per hour, (3) PT/OT services at $75 per hour, and (4) ST services at $76 per hour.

An estimate of the quantity of services received was obtained from the additional services forms filled out by the parents at the 2 week, 6 month, and 12 month assessments. Parents were asked to report, from a list of services, the number of sessions attended, hours per session, total hours of service received, and the agency providing the services. Each form was studied for inconsistencies or incompletions, and followed-up with the transition team personnel and parents to obtain an accurate as possible estimate of the quantity of services received by each family in the study. Total hours for PHN, EI, PT/OT, and ST were tallied and multiplied by their respective costs per hour to determine total cost of these services in each group. These were divided by the number of children in the group to arrive at average cost.

All figures on Table 7.5 are in constant 1990 dollars. For purposes of the calculation of transition team cost per child, there were 21 children in the experimental group and 24 in the control group--the actual number of children served through 12 months at the time of this analysis; for additional services cost estimation, data were available for 23 in the control group and 21 in the experimental group.

As Table 7.5 indicates, the transition team had a significant impact on whether the families sought and obtained early intervention services for their children. As shown in the previous section on treatment verification, children in the experimental group received five times as many hours of early intervention services as children in the control group (1,210.5 hours versus 242 hours). The transition team had a lesser impact on the amount of public health nursing visits received--327 visits for the experimental group and 275 visits for the control group children. There is a small difference between hours of PT/OT and ST received by children in each group which favors the low-intensity group. Total hours of PT/OT were 308.5 for high intensity and 352 for low intensity. While ST hours totaled 6 for the high intensity and 14.5 for the low intensity infants.

Overall, the transition team seems to have accomplished its goal of connecting children with early intervention services in their community. Thus, in addition to case management and referral, the transition team is providing an important child-find service. Due to random assignment, we can assume that there are at least as many children in the control group who are eligible for such services and are not receiving them. Since Ohio has decided to mandate services to infants and toddlers under Part H of P.L. 99-457, this is an especially interesting finding for the Department of Health who is the lead agency. In addition, the data suggest that public nurse home visits and whether or not the child receives PT/OT and ST services are probably independent of the transition team. In other words, children in both groups are balanced with respect to physical disability and will receive those services if they need them regardless of the existence of a transition team.

Data Collection

Data collected at the Columbus project included the results of outcome measures used across all EIRI sites and measures specific to this study. Outcome measures included assessments of both child and family functioning. As indicated earlier, infants were enrolled in the study approximately one month prior to their discharge from the NICU, and they were pretested two weeks following discharge. Pretest data were collected on 52 infants. Outcome data collected on subjects at 6, 12, 18 and 24 months corrected age are presented. All EIRI assessments took place at CCH in conjunction with NICU follow-up clinic visits.

Recruitment, training, and monitoring of diagnosticians. In June 1988, diagnosticians were trained in Columbus by the EIRI Evaluation Specialist to administer the Battelle Developmental Inventory (BDI). Three diagnosticians were Registered Occupational Therapists employed in the Occupational Therapy Department of Columbus Children's Hospital. The fourth diagnostician was an Early Childhood Specialist employed in the Child Life Department of Columbus Children's Hospital. While their work assignments involved in-patient and out-patient care, none of the therapists was assigned to the NICU or the Neonatal Follow-up Clinic. They evaluated the subjects as a part of their regular employment and were uninformed as to the purpose of the study and the group assignment of the infants.

Prior to the formal BDI training, the diagnosticians were required to become familiar with the BDI through a review of the test manuals, practice in scoring, viewing of a videotape of test administration procedures, and completing a self-mastery test. The diagnosticians then completed three practice BDI administrations. The third practice session was videotaped and reviewed by the EIRI assessment coordinator who then certified the diagnostician. In each year following certification, 10% of each diagnostician's test administrations were shadow scored for reliability by the onsite assessment coordinator. The assessment coordinator was responsible for tracking and scheduling evaluations for each subject. A more in depth discussion of test administration procedures is available in the EIRI 1986-87 annual report.

Schedule of assessment measures. Table 7.6 presents a schedule for the administration of assessment measures from enrollment through 24 months CCA (see Table 7.7 for a description of these measures).

Two weeks post discharge. Two weeks following discharge from the NICU, all infants in the study were scheduled for the first visit to the Neonatal Follow-up Clinic, where their health status, growth, pulmonary function, and rehospitalization record were evaluated. At that time, infant assessments also included the Battelle Developmental Inventory (BDI) and the Infant Neurological International Battery (the Infanib), a measure of neurologic integrity in the newborn and infant. The Parenting Stress Index (PSI), an assessment of the stress present in the parent-child system; the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the separateness or connectedness and adaptability of the family members to the family; the Family Support Scale (FSS), a measure of different sources of support available to families with young children; the Family Resource Scale (FRS), a measure of the different kinds of resources available to the family; the Family Inventory of Life Events and Changes (FILE), which assesses the life events and changes experienced by the family during the previous 12 months; and the Parent Survey (demographic information) were completed by the parents. Parents were paid $20 for completing this assessment battery. Tests and questionnaires were returned to EIRI for scoring, data entry, and storage.

Table 7.6

Schedule of Assessment Measures--Columbus Medically Fragile Study

	2 wks. Post Discharge	Assessments at 6 months CCA[*]	Assessments at 12 months CCA[*]	Assessments at 18 months CCA[*]	Assessments at 24 months CCA[*]
Battelle Developmental Inventory	X		X		X
Parenting Stress Index	X		X		X
Family Adaptability and Cohesion Evaluation Scales	X		X		X
Family Support Scale	X	X	X	X	X
Family Resource Scale	X	X	X	X	X
Family Inventory of Life Events and Changes	X		X		X
Additional Services Survey	X	X	X	X	X
Medical Severity Index					
EIRI Parent Survey	X		X		X
Infant Neurological International Battery	X	X	X		
Medical Visit Summary	X	X	X	X	X
Bayley Scales of Infant Development		X		X	
Vineland Adaptive Behavior Scales				X	
Report of Child Health			X		X
Parent/Child Interaction Video			X		X

[*] Corrected Chronological Age (age corrected for prematurity)

Table 7.7

Description of Tests Administered for Columbus Medically Fragile Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Bayley Scales of Infant Development (Bayley, 1969)	Assesses developmental status of infants from age 2 months to 2½ years. This standardized test includes a Mental Scale, Motor Scale, and Infant Behavior Record.
Infant Neurological International Battery (Ellison, Horn, Browning, 1985)	Assesses infants from birth to 1½ years. It is used to test motor skills and to assess the neurological integrity of infants.
Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984)	This measure assesses individual performance for daily activities related to personal and social self-sufficiency. It measures adaptive behavior in four domains: Communication, Daily Living Skills, Socialization, and Motor Skills. This test is completed by the parent.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, marital, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.

6-month assessment. The 6-month assessment was scheduled when the infant was 6 months old (age corrected for prematurity). At this time, the infant received a physical examination and was assessed using the Bayley Scales of Infant Development and the Infant Neurological International Battery. At that same time, parents completed the Carey Infant Temperament Scale, the FSS, and the FRS. An additional services form reporting services that were used since pretest in conjunction with infant care and development, was completed in an interview with the social worker.

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12-month assessment. A third assessment was scheduled when the infants were 12 months (ages corrected for prematurity). At the assessments, infants and their parents again completed the 2-week post discharge battery. In addition, parents completed the Parent Satisfaction Survey and the Report of Child Health. The additional services data was provided by the parent during an interview with the social worker. At the 12-month assessment, parents and infants were videotaped during a scripted 16-minute period which included free play and structured activities. The videotapes are being coded and scored as a measure of parent-child interaction.

18-month assessment. The assessment at 18-months consisted of a physical examination, re-administration of the Bayley, the FSS, the FRS, and the additional services survey. In addition, parents completed the Vineland Adaptive Behavior Scales. Parents were paid $20 for completing each outcome test battery. Attrition was described earlier in Table 7.1 which describes the number of infants who have completed each posttest to date.

24-month assessment. The 24-month assessment included a physical examination. The 24-month assessment battery was the same as that given at 12 months except that children were not given the Infanib. The interview for the additional services information was conducted by the on-site assessment coordinator. Attrition was given earlier in Table 7.1 which describes the number of infants who have completed each posttest to date.

Results and Discussion

The purpose of the Columbus Medically Fragile study was to compare the effectiveness of comprehensive and coordinated early intervention services begun prior to the infant's discharge from the NICU (high-intensity) to a low intensity intervention consisting of medical follow-along and referral.

Contextual Variables

The demographic characteristics for the subjects who were enrolled in the study at the time of the 2-week post discharge assessment is presented in Table 7.8. The demographic, medical characteristics for the infants who were in the study at the 12- and 24-month assessments were examined and are consistent with the results for the infants at enrollment. The differences between the groups are small and consistent. Using a p-value $\leq .10$, years of education of the father is the only difference at enrollment. At 12-months posttest, years of education of the father and hours worked have a p-value $\leq .10$, in favor of the high-intensity families.

A comparison of the medical characteristics of all infants in the high-intensity and low-intensity intervention groups at the time infants were enrolled in the study (Table 7.9) indicated that the groups were similar on most of the medical severity measures. The ES scores on technology dependence and feeding status indicate differences between the groups on these measures, one in favor of the low-intensity group, and the other in favor of the high-intensity group. The results for the infants assessed at 12- and 24-months indicated statistically significant differences on feeding status with the low-intensity infants having higher (more severe) scores. A medical severity index incorporating these medical indicators was developed and used as a covariate in the analysis of outcomes presented in the Results section later in this report.

Table 7.10 shows infant scores for the sample at the time of the two-week post discharge for the BDI and the 2-week, 12- and 24-month Family Inventory of Life Events and Changes (FILE). The groups were similar on all of the BDI domains and the total score and on all of assessments for the FILE. The subjects who completed the 12- and 24-month assessments also showed similar scores for these measures. Other family measures collected at the time of the two-week post discharge included the Parenting Stress Index (PSI), Family Adaptability and Cohesion Evaluation Scales

Table 7.8

Comparability of Groups at Two Weeks Post Discharge on Demographic Characteristics for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
Variables	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Age of child in months as of 7/1/89	4.0	(4.9)	26	4.0	(5.2)	26	.96	.00
• Age of mother in years	25.6	(6.7)	26	27.3	(6.3)	26	.35	.25
• Age of father in years	29.6	(8.2)	25	30.4	(7.3)	24	.70	.10
• Percent male*	31	---	26	19	---	26	.35	-.24
• Years of education for mother	12.5	(2.0)	26	12.6	(2.4)	26	.75	.05
• Years of education for father	12.2	(1.2)	26	13.1	(2.3)	26	.10	.75
• Percent with both parents* living at home	76	---	25	77	---	26	.94	.02
• Percent of children who are* Caucasian	81	---	26	81	---	26	1.00	.00
• Hours per week mother employed	9.5	(15.4)	26	12.2	(17.1)	26	.55	.18
• Hours per week father employed	31.6	(18.8)	25	39.2	(16.6)	25	.14	.40
• Percent of mothers employed as* technical managerial or above	8	---	26	23	---	26	.13	.37
• Percent of fathers employed as* technical managerial or above	22	---	23	31	---	26	.49	.18
• Total household income♦	$25,540	($22,184)	25	$31,962	($27,495)	26	.36	.29
• Percent of children in daycare* more than 5 hours per week	15	---	26	4	---	26	.17	-.32
• Number of siblings	1.5	(1.8)	26	1.2	(1.3)	26	.48	-.17
• Percent with English as* primary language	96	---	26	100	---	26	.57	.16

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^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

♦ Income data were categorical and were converted by using the midpoint of each interval into continuous data.

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Table 7.9

Comparability of Groups at Enrollment on Medical Characteristics for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES[^]
Gestational age (Weeks)	31.0	(4.7)	26	31.1	(4.5)	26	.95	.02
Birthweight (grams)	1744.2	(861.2)	26	1615.1	(883.6)	26	.60	-.15
Severity Index at Enrollment (Range: 3 to 45)	15.3	(4.1)	26	14.2	(6.2)	26	.50	.27
Length of Hospitalization (Days)	102.4	(75.4)	26	118.6	(91.0)	26	.49	-.21
Total Doses of Medication Daily (at Pretest)	7.1	(9.5)	26	5.4	(9.0)	26	.50	.18
Technology Dependence (at Pretest)[*]	.7	(1.1)	26	1.2	(1.6)	26	.17	-.45
Feeding Status (at Pretest)[*]	2.5	(1.4)	26	1.9	(1.3)	26	.16	.43
Sensory Impairment (at Pretest)[*]	1.1	(.9)	26	1.1	(1.1)	26	.89	.00
Infant International Neurological[♦] Battery (INFANIB) (Range: 20 to 100)	59.9	(6.4)	25	58.0	(7.4)	26	.64	-.30

[^] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the $\bar{X}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

[*] Technology dependence, feeding status, and sensory impairment at discharge were measured on a scale of 0-5 with low scores being more favorable.

[♦] Higher scores on the INFANIB indicates greater neurological maturity.

(FACES), the Family Resource Scale (FRS) and the Family Support Scale (FSS). None of these measures is included in the comparison of groups given in Table 7.10. Instead these four family measures, collected at the two-week post discharge administration, are presented as outcomes later in this report. Infants were hospitalized for up to 6 months prior to discharge from the NICU. This meant that many families in the more intensive intervention received a significant number of visits prior to the collection of the family measures at two weeks following the infants' discharge from the NICU. During this period, services focused on helping the family prepare for the transition of the infant to the home. Transition team

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Table 7.10

Comparability of Groups on Pretest BDI and on Pretest, 12 and 24 Month FILE Measures for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES[^]
• Age in months at pretest	4.0	(4.9)	26	4.0	(5.2)	26	.96	0
• Battelle Developmental[+] Inventory (BDI) Raw Scores for:								
Personal/Social	6.0	(4.1)	26	8.0	(6.6)	26	.21	.49
Adaptive Behavior	3.8	(2.8)	26	4.5	(3.9)	26	.47	.25
Motor	4.9	(4.4)	26	5.0	(4.7)	26	.98	.02
Communication	4.7	(2.1)	26	4.9	(2.6)	26	.82	.10
Cognitive	3.4	(2.9)	26	3.0	(3.5)	26	.61	-.14
TOTAL	22.9	(14.5)	26	25.3	(20.0)	26	.61	.17
Pretest								
• Family Index of Life Events and Changes (FILE)	11.4	(5.2)	26	11.8	(7.6)	26	.83	-.08
• 12-Month FILE	8.4	(4.5)	23	8.3	(5.3)	21	.95	-.02
• 24-Month FILE	9.2	(6.0)	23	7.5	(3.6)	21	.26	-.28

[^] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). For the PSI and FILE, the numerator of the ES is calculated as: Less Intensive - More Intensive, as lower scores are preferred. A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

[+] Statistical analyses for BDI Scores were conducted using raw scores for each of these scales and the results of these are presented.

members believe that there is a high probability that these measures of family functioning could have been influenced by the services that were provided. While families in the more intensive intervention received significant quantities of intervention from the transition team between the time of enrollment and the two-week post discharge assessment, the services were not focused on child development activities. Consequently measures of child functioning collected at the time of the two-week post discharge assessment are not analyzed as outcomes.

Effects of High Intensity vs. Low Intensity Intervention on Measures of Child Functioning

Analysis of covariance (ANCOVA) procedures were used to evaluate differences between groups on measures of child and family functioning following the provision of intensive, coordinated early intervention transition services to one group of infants and less intensive routine medical follow along for the other group. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually less than five) in any given analysis. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. For example, age at pretest and level of severity at discharge were used as covariates for 6-month Bayley Mental Developmental Index scores. The combination of these variables reduced the amount of unexplained variance in the 6-month Bayley scores better than other combinations of pretest and demographic variables. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $p \leq .10$, and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977), in those cases where a covariate or set of covariates could be found which correlated with the dependent variable in question (which was almost always the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 94% for finding moderate sized differences (defined by Cohen as differences of a half a standard deviation).

The ANCOVA results for the 6- and 12-month child outcome measures are presented in Table 7.11. The results for the Infanib total score and Bayley motor and mental raw scores at the 6-month posttest indicate no statistically significant differences between the groups. The analysis of the BDI total and domain raw scores at 12-months posttest suggests that infants in the two groups were not significantly different on BDI Personal Social, Adaptive Behavior, Motor, Communication, or Cognitive scores. The largest difference is for BDI personal social skills which has a p-value of .12 and effect size (ES) of .38. Beginning at the 12-month reassessment, parents were asked to rate their child's health. The 12-month results for the children in the two groups show no statistically significant differences between the groups.

The 18- and 24-month child outcome measures are presented in Table 7.11. The child measures at 18-months include the Bayley measures of motor and mental functioning and the Vineland Adaptive Behavior Scales with communication, daily living skills, and social domains. The results of the ANCOVA on the BDI scores at 24-months show no statistically significant differences between the low and high intensity groups for any of the five areas of child functioning. However, the 24-month rating of child's health by the parents shows a significant difference, in favor of the transition group infants, on general health.

Table 7.11

Summary of Posttest ANCOVAs on Measures of Child Functioning for Alternative Intervention Group for Columbus Medically Fragile Study

		Low Intensity Group				High Intensity Group						
	Covariate♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES^
6-MONTH ANALYSES												
INFANIB+ Total	1,2,3	51.9	(15.5)	54.6	21	56.0	(10.2)	53.2	20	.11	.74	-.09
Bayley*												
Motor	1,6,4	70.3	(25.3)	73.5	22	83.4	(22.4)	80.2	19	.83	.39	.26
Mental	1,8	75.0	(21.1)	78.5	22	93.1	(33.1)	89.6	19	2.10	.16	.53
12-MONTH ANALYSES												
Battelle Developmental Inventory+ (BDI)												
Personal/Social	1,2	26.6	(10.4)	27.1	23	31.6	(7.3)	31.1	21	2.60	.12	.38
Adaptive Behavior	1	19.7	(11.1)	20.6	23	23.0	(10.1)	22.2	21	.32	.58	.14
Motor	1,5	25.9	(14.9)	27.4	23	28.3	(14.2)	26.8	21	.02	.89	-.04
Communication	1,5	16.0	(7.7)	16.6	23	19.1	(6.7)	18.5	21	.89	.35	.25
Cognitive	1,5	14.0	(7.2)	14.8	23	14.7	(5.8)	14.0	21	.21	.65	-.11
TOTAL	1	102.6	(49.1)	106.3	23	116.8	(40.9)	113.1	21	.33	.57	.14
General Health	1,6,7	1.6	(.7)	1.7	17	1.7	(.5)	1.7	21	.01	.92	0
Infanib+ Total	1	63.1	(22.7)	64.2	23	59.5	(21.5)	58.4	20	.84	.37	-.26

+ INFANIB and BDI statistical analyses were conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity vs. Low Intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

♦ 1 = Medical severity index total score at enrollment, 2 = Gestational age (weeks), 3 = Birthweight, 4 = Feeding status at enrollment, 5 = Number of days on ventilator, 6 = Length of initial hospitalization, 7 = Number of days on oxygen, 8 = Chronological age in months at date of BDI pretest.

* Bayley analysis was conducted using standard scores.

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Table 7.11

Summary of Posttest ANCOVAs on Measures of Child Functioning for Alternative Intervention Group for Columbus Medically Fragile Study

		Low Intensity Group				High Intensity Group						
	Covariate[♦]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES[^]
18-MONTH ANALYSES												
Vineland[+]												
Communication	1	78.9	(10.6)	79.8	22	80.2	(11.5)	79.3	21	.02	.89	-.05
Daily living skills	1,2,3	15.0	(9.2)	16.0	22	15.9	(8.7)	14.9	21	.20	.65	-.12
Social	1	27.5	(9.8)	28.1	22	31.4	(6.6)	30.8	21	1.3	.26	.28
Bayley[▲]												
Motor	1	69.5	(21.3)	70.9	22	67.3	(20.5)	65.9	21	.71	.40	-.23
Mental	1,4	71.6	(23.9)	73.1	22	73.7	(23.6)	72.2	21	.02	.89	-.04
24-MONTH ANALYSES												
Battelle Developmental Inventory[+] **(BDI)**												
Personal/Social	1,7	55.7	(24.3)	58.0	23	58.6	(21.0)	56.3	21	.09	.77	-.07
Adaptive Behavior	1,5	36.7	(17.9)	38.2	23	39.9	(15.6)	38.2	21	.00	.99	0
Motor	1,6	54.1	(29.8)	55.9	23	52.2	(26.2)	51.4	21	.35	.56	-.15
Communication	1,4	27.8	(10.5)	28.6	23	31.9	(7.0)	31.1	21	1.2	.28	.24
Cognitive	1,4	20.6	(8.4)	21.2	23	21.7	(7.7)	21.0	21	.01	.93	-.02
TOTAL	1,6	194.9	(87.3)	201.8	23	205.3	(71.5)	198.3	21	.03	.87	-.04
General Health	1,5	1.7	(.7)	1.78	23	2.2	(.7)	2.2	21	2.96	.09	.53

[+] Vineland and BDI statistical analyses were conducted using raw scores for each of the scales and these are presented.

[^] Effect Size (ES) is defined here as the difference between the groups (High Intensity vs. Low Intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

[♦] 1 = Medical severity index total score at enrollment, 2 = Chronological age in months at date of BDI pretest, 3 = Number of days on ventilator, 4 = gestational age (weeks), 5 = Feeding status at enrollment, 6 = Sensory impairment at enrollment, 7 = Highest completed year of education--mother.

[▲] Bayley analysis was conducted by using standard scores.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Table 7.12 presents the results of the ANCOVA comparisons for the two-week post discharge, 6- and 12-month assessments of family functioning. As explained earlier in this report, the two-week post discharge PSI, FSS, FRS and FACES scores are included as outcomes.

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Evaluating the significance of differences in family functioning using a p-value of .10 or less indicates significant differences on the two-week post discharge FSS, the FRS at 12 months, and other related stress on the PSI at 24 months. None of these measures was statistically significant at any of the other assessments. The family measures do show consistently positive effect sizes across all of the outcomes except FACES cohesion and PSI child related scores at 2 weeks post discharge and the 12 month FACES cohesion score. The average ES across all measures of family functioning is approximately .25 suggesting a 1/4 standard deviation difference between the groups on family outcomes.

The results for the FRS show higher resources available to high-intensity families at all of the assessments. There are four subscales of the FRS. These include general resources, physical resources, time availability and external support. The two subscales most likely impacted by the intervention were time availability and external support. MANOVAs were completed on these subscales for the 12- and 24-month assessments and showed no statistically significant differences on the external support subscale although both the 12- and 24-month time availability subscale showed significantly higher scores for the more-intensive families, with effect sizes of .59 and .54, respectively.

Subgroup Analyses

Rural service delivery. One variable which may have affected the efficacy of the transition team intervention relative to the services received by the infants in the low-intensity intervention was the county in which the family and child resided at the time of the intervention. Franklin county encompasses the Columbus urban area. The families and infants who participated in the study resided in Franklin County or one of 18 rural counties in southeastern Ohio. The transition services provided to the high-intensity group may have been more valuable to the infants and families who live in rural areas. The project was based in Franklin county at

Table 7.12

Summary of ANCOVAs on Measures of Family Functioning for Alternative Intervention Groups for Columbus Medically Fragile Study

		Low Intensity Group				High Intensity Group						
	Covariate♦	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	P Value	ES^
2-WEEK POST DISCHARGE												
Parenting Stress Index♣ (PSI)												
Child Related	1	109.8	(21.8)	109.3	25	113.5	(25.1)	113.9	25	.51	.48	-.21
Other Related	2	128.7	(27.6)	126.2	25	117.0	(26.5)	119.5	25	.80	.38	.24
TOTAL	2	238.5	(47.4)	234.5	25	230.5	(45.4)	234.5	25	.00	1.00	0
Family Adaptation and Cohesion• Evaluation Scales (FACES)												
Adaptation	3	21.8	(5.6)	21.9	26	24.7	(7.4)	24.5	26	2.20	.14	.46
Cohesion	2,4	37.7	(6.3)	38.5	25	39.0	(8.3)	38.2	26	.04	.85	-.05
Family Support Scale (FSS)	5	25.8	(9.6)	25.9	26	30.8	(10.4)	30.6	26	3.10	.09	.49
Family Resource Scale (FRS)	2,4	116.0	(18.3)	117.4	25	125.3	(17.4)	123.9	26	1.90	.17	.36
6-MONTH POSTTEST												
Family Support Scale	1,2	29.0	(12.4)	29.3	21	32.1	(8.4)	31.8	20	.65	.42	-.20
Family Resource Scale	3,4	120.3	(12.5)	122.1	21	128.6	(13.8)	126.8	20	2.21	.15	.38
12-MONTH POSTTEST												
Parenting Stress Index♣ (PSI)												
Child Related	2,5	110.6	(19.5)	110.2	22	105.3	(22.9)	105.7	21	.67	.42	.23
Other Related	2,5	133.0	(23.7)	132.5	22	124.8	(31.2)	125.3	21	1.10	.31	.30
TOTAL	2,5	243.6	(39.1)	242.6	22	230.1	(51.2)	231.0	21	.48	.49	.30
Family Adaptation and Cohesion• Evaluation Scales (FACES)												
Adaptation	2,6,7	21.8	(6.8)	22.0	23	23.0	(8.1)	22.9	21	.24	.63	.13
Cohesion	2,5,8	37.7	(6.6)	37.8	22	35.5	(9.5)	35.4	21	1.20	.28	-.36
Family Support Scale (FSS)	7	25.7	(10.9)	25.5	23	29.0	(10.0)	29.2	20	1.40	.24	.34
Family Resource Scale (FRS)	7,2,5	116.5	(17.5)	116.9	22	126.9	(16.3)	126.4	20	4.00	.05	.54
External Support	2	23.3	(4.3)	23.5	23	24.4	(4.5)	24.2	20	.34	.56	.16
Time Availability	4,7	37.9	(10.7)	37.6	23	43.6	(11.1)	43.9	20	4.20	.05	.59

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). For the PSI and FILE, the numerator for the ES is calculated as: Less Intensive - More Intensive, as lower scores are preferred. A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

♣ A low raw score indicates lower stress level.

• Scores for each subscale of the FACES are derived based on linear scoring where high scores are preferred.

♦ 1 = Hours employed per week--mother; 2 = highest completed year of education--mother; 3 = mother's occupational SES category; 4 = Sensory impairment at enrollment; 5 = Total yearly income for household; 6 = Number of days on ventilator; 7 = Family Index of Life Events and Changes (FILE); 8 = Gestational age (weeks)

Table 7.12

Summary of ANCOVAs on Measures of Family Functioning for Alternative Intervention Groups for Columbus Medically Fragile Study

		Low Intensity Group				High Intensity Group						
	Covariate[♦]	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	P Value	ES[^]
18-MONTH ANALYSIS												
Family Support Scale	1	23.9	(8.9)	24.1	22	28.0	(10.0)	27.7	21	1.80	.19	.40
Family Resource Scale	1,2,3	118.0	(17.4)	118.3	21	120.8	(16.3)	120.5	20	.25	.62	.13
24-MONTH ANALYSIS												
Parenting Stress Index[♠] (PSI)												
Child Related	4,6	116.5	(19.0)	114.7	23	110.7	(17.3)	112.5	21	.18	.68	.12
Other Related	4,3	137.0	(26.4)	134.6	22	118.9	(21.4)	121.3	21	3.30	.08	.50
TOTAL	4,3	253.1	(40.4)	248.7	22	229.6	(33.8)	234.0	21	1.80	.19	.36
Family Adaptation and Cohesion[•] Evaluation Scales (FACES)												
Adaptation	7	20.8	(7.0)	21.2	23	21.7	(6.0)	21.3	20	.00	.95	.01
Cohesion	8,4	36.3	(6.4)	37.2	23	39.7	(5.9)	38.8	20	.78	.38	.25
Family Support Scale (FSS)	1	25.2	(7.0)	25.4	22	26.8	(11.6)	26.6	21	.20	.66	.17
Family Resource Scale (FRS)	4,5	111.3	(18.5)	114.9	23	126.1	(13.8)	122.6	21	2.60	.12	.42
External Support	1,5	22.4	(4.2)	22.8	23	24.6	(3.5)	24.2	21	1.50	.23	.33
Time Availability	4,2,5	35.0	(9.2)	36.2	23	42.9	(9.6)	41.2	21	3.60	.06	.54

[^] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size). For the PSI and FILE, the numerator for the ES is calculated as: Less Intensive - More Intensive, as lower scores are preferred. A positive ES difference indicates a variable which is more favorable for the high-intensity group, while a negative ES is more favorable for low-intensity group subjects.

[♠] A low score indicates lower stress level.

[•] Scores for each subscale of the FACES are derived based on linear scoring where high scores are preferred.

[♦] 1 = Highest completed year of education--mother; 2 = Family Index of Life Events and Changes; 3 = Total yearly income for household; 4 = Highest completed year of education--father; 5 = Feeding status at enrollment; 6 = Hours employed per week--mother; 7 = Mother's occupational SES category; 8 = Chronological age in months at date of BDI pretest

Columbus Children's Hospital. As mentioned in the section on the rationale for the study, most of the improvements and advances in perinatal care have been concentrated in the tertiary care hospital and environment. Infants and families who live near the hospital have easier access to treatment and early intervention services that are focused on their needs while those living in rural areas have limited access to

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services. Thus, the transition services provided to the high intensity group may have been more beneficial to the infants and families who live outside of Franklin county.

To examine whether there was a differential impact of treatment for infants in rural areas, all of the infants who resided in Franklin County during intervention were removed from the data. The rural high- and low-intensity groups were examined for pretest differences on demographic, medical, child, and family development variables. Significant differences were found for hours worked by the father and the Family Support Scale. The correlations between these variables and 6-, 12-, 18-, and 24-month outcomes were analyzed and covariates selected where correlations were significant. ANCOVA was completed for the 6-, 12-, 18-, and 24-month posttest measures of child and family functioning with only the rural infants who were assigned to the high- and low-intensity interventions. The results show no statistically significant differences on the measures of child functioning. Of the family measures examined only the 18-month FSS is statistically significant with a p-value of .03 and effect size of .71. The results for family and child functioning are very similar to the ANCOVA results presented for all of the families who participated.

Severity. One of the conclusions of a recent review on the efficacy of early intervention was that one of the strongest predictors of developmental progress for infants and children is severity of impairment (Dunst, Snyder, & Mankinen, 1989). The level of severity of impairment may interact with early intervention services so that differential effects of the intervention result depending on whether the impairment is mild or severe. To examine whether interactions between severity and intervention occurred in this study infants were placed into a severe or mild disability category based on their medical severity index at pretest. As mentioned earlier in this report the medical severity index was computed from nine variables which included degree of technology dependence, oxygen dependence, respiratory status, age at discharge, neurologic status, ultrasound/CT findings, head circumference, feeding status, and sensory impairment. A group by severity of medical condition (2 x 2) analysis of covariance was then conducted for 6-, 12-, 18-, and 24-month Bayley, Vineland, Infanib, and BDI scores. The results of this analysis showed statistically significant interaction effects between medical severity and the intensity of the intervention for the children in the two treatment groups on the 6-month Bayley Mental Developmental Index. At 6-months the transition infants with more mild delays performed significantly (p = .005, ES = 1.2) better than the infants with mild medical complications who received traditional services. In contrast the severe traditional infants scored significantly higher than severe transition group infants (p = .005, ES = -.79) on the Bayley Mental Developmental Index. However, this difference did not hold for any of the other child outcome measures at the other reassessments.

Conclusions

The treatment verification data confirms that the intervention of the Columbus Medically Fragile Project was implemented as intended. The traditional intervention consisted of NICU referrals and follow-up while the transition team intervention provided home and center based visits, helped to develop and implement IFSPs and to develop relationships between families and local service providers to ensure that timely, appropriate services were actually provided. The treatment verification data shows that the transition team services were more intensive as measured by the direct services provided by the team and by differences in IFSP development at 18-month reassessment. The groups also differed in the number of additional service hours. The high intensity infants were receiving significantly more early intervention service hours at the 12-month reassessment than the infants in the low-intensity intervention. At the time of the 24-month reassessment, they were receiving 2½ times as many early intervention service hours.

Overall, pretest comparisons indicate that randomization procedures have resulted in well-matched groups as the intervention phase of this project began. At enrollment, statistically significant differences were found on one demographic measure, none of the medical characteristics and none of the infants' developmental measures. These results suggest the groups are comparable. However, no family measures were collected prior to the initiation of early intervention services.

The analysis of covariance by intervention group for the six month Infanib and the six and eighteen month Bayleys show no statistically significant differences between the groups on neurological, motor or mental development as measured by these scales. The results of the 12- and 24-month BDI total and domain scores and the 18-month Vineland also show no statistically significant differences by group when the data for the children who completed these assessments was analyzed.

The results for family functioning suggest that there are some differences, in favor of the more intensive group families, on measures of family support, family resources and parent stress. The average ES on family measures across all assessments shows approximately 1/4 of a standard deviation difference in favor of the more intensive families. Nearly all of the effect sizes examined are positive although few are statistically significant. These differences are less convincing because there are not consistent differences on the same measures across the longitudinal assessments except for the time availability domain of the FRS which is significant at both the 12- and 24-month assessments.

It is clear that the more intensive families and their infants received more hours of service, both from the transition team and from local early intervention programs. The transition team services focused on helping parents access services and teaching them how to deal with medical and other developmental concerns of their infants. Some of the local early intervention services were home-based while others were center-based. It is logical that these services could result in greater time availability for parents who received the most service. This may have been achieved by reducing the time demands on families of obtaining appropriate services for their medically fragile infants.

The direct intervention provided to transition team infants was greatest between the time of enrollment and the 6-month posttest and had ended by about 12 months posttest. However, as shown by the additional services data the infants in the more intensive intervention were receiving 5 times more intensive early intervention service hours in their local communities at the time of the 12-month posttest. The 24-month additional services data shows that the differences in early intervention decreased between the 12 and 24-month assessments. At 24-months, the children in the more intensive group were receiving two-and-a-half times the number of early intervention service hours than the less-intensive group subjects although that difference is not statistically significant. These differences, which may be attributed to the transition team follow-up with local service providers, may result in differences in later posttest assessment and analysis.

The subgroup analysis for rural infants provides no evidence that the transition intervention benefitted infants and families living in rural areas when compared with the traditional services provided to rural infants and families. There is some evidence that the mildly delayed infants had temporary, statistically significantly gains on the Bayley Mental Developmental Index at the 6-month reassessment. The intervention services provided by the transition team were greatest from enrollment to 6 months adjusted age and decreased in intensity of home visits between 6 and 18 months. However not only is the 18-month Bayley Measure of Mental Development not statistically significant, it is slightly negative for the mildly impaired transition sevice infants. Consequently the 6-month difference must be interpreted with caution and may be random fluctuation in the sample.

Interpretation of the results for family functioning is made more difficult for two reasons. First, the one study of early intervention with medically fragile infants identified in the literature review did not incorporate measures of family outcome. Second, no family measures were collected prior to initiation of the early intervention services. If there were pretreatment differences on these measures, it is not possible to control for such differences. It is therefore more difficult to draw conclusions about the moderate differences on measures of family functioning that are observed in this study.

The high-intensity intervention cost approximately $7800 more than the low-intensity intervention. There is no evidence that the intervention was cost-effective for child development as measured at the 6-, 12-, 18- and 24-month assessments. As discussed in the literature review, there are few studies that are comparable to the one presented in this report. Several studies have found positive effect sizes for child outcomes when early intervention services were provided to premature, low birth weight infants. The Piper et al. study examined the effects of early intervention with medically fragile infants and found no statistically significant differences resulting from the more intensive intervention. However, the Piper study did not incorporate measures of family functioning into the analysis although the intervention combined physical therapy and parent-training for the more intensive group infants and families.

If the main benefit of the transition team and early intervention services is the release time that they provide families as measured by the FRS time availability domain, then there are important implications for the types of services provided and the cost of such services. Respite care is less costly, given the number of service hours, than the early intervention services provided in this program. This raises the question of whether the same effects could be achieved at a lower cost by changing program services. It is also possible that differences in outcome will appear later, when the children reach 36-months adjusted age. The Infant Health and

Development Project did not find statistically significant differences between the intervention groups until the children were 36 months adjusted age. The continuation of early intervention services at higher levels to the more-intensive group infants and families at the 24-month assessment is evidence that differences in service continue and may be accompanied by measurable differences in child and/or family outcomes as the longitudinal follow-up continues.

Nearly $6,000 of the difference in expenditure related directly to transition team services which were financed by federal grants while nearly $2,000 of the difference in the cost of services was from state and local expenditures on the Public Health Nursing and Early Intervention services. These costs must be weighed against the effects for families. It is important to keep in mind the alternative uses of the $7800 and whether or not it would have a greater impact if allocated to different programming for these children and families or even to other programs for different families. The answer to these questions will become more definitive as the longitudinal follow-up of the children in this study continues.

DES MOINES PUBLIC SCHOOLS

Project #8

COMPARISON: Children with Mild to Severe Disabilities -- Center-based intervention plus parent involvement vs. center-based intervention only

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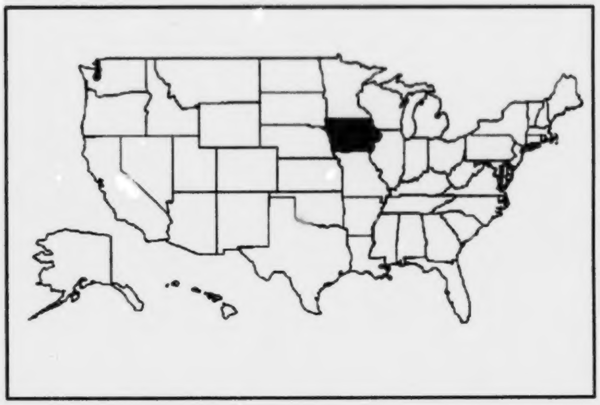
LOCATION: Des Moines, Iowa

DATE OF REPORT: 10-1-1992

Rationale for the Study



Parent involvement is often considered an important part of early intervention programs for young children with disabilities. This belief is so strong that it has been incorporated into the law mandating services for these young children (P.L. 99-457). Unfortunately, the empirical support for this belief is not as clear as one might assume based on the P.L. 99-457 mandate (White, Taylor, & Moss, 1992). Concerns have been raised regarding the efficacy of parent involvement in general and, specifically, to what types of parent involvement are most beneficial to children and families (Casto & Mastropieri, 1986; White et al., 1989). This study examined the effects of adding one particular type of parent involvement to an existing center-based early intervention program for children with disabilities. The type of parent involvement program investigated as a part of this study included weekly parent meetings which focused on: a) training parents to work with their children on skills/behaviors, b) educating parents in various topics (such as legal rights, child assessment, child development, etc.), and 3) providing support to parents in the form of a parent group and assistance in accessing available resources.

Review of Related Research

The issue of parent involvement in early intervention has been a subject of many reviews of literature (Bronfenbrenner, 1974; Comptroller General, 1979; Datta, 1971; Floren & Dokekci, 1983; Karnes & Lee, 1978; Lazar & Darlington, 1982). These reviews have almost unequivocally concluded that early intervention programs which involve parents will be more effective than those that do not. In examining the research studies cited by these reviews, White et al. (1992) found that the individual results did not support the conclusions of the reviews. White et al. raised further concerns by concluding that the research cited in these reviews had focused only on children who are disadvantaged, was of relatively poor methodological quality, and had defined parental involvement primarily as using the parent as a supplemental therapist.

Extending their analysis, White et al. (1992) raised the question, "What are the effects of parent involvement programs on young children with disabilities and on their families?" Using data that had been prepared for a meta-analysis of early intervention (Casto & Mastropieri, 1986), White et al. compared effect sizes from 89 studies that used children with disabilities as subjects. All of these studies included some type of parent involvement. These studies were divided into two categories for analysis: studies that included extensive/moderate parent involvement and those that included little/no parent involvement. The results of this analysis were equivocal with respect to degree of parent involvement (i.e., more parent involvement was not necessarily better). It should be made clear that not all of these studies were examining parent involvement, only that these studies included parent involvement and the parent involvement could be coded.

Studies (from the above analyses) that specifically investigated the effect of parental involvement in early intervention for children with disabilities were individually examined. Unfortunately, the majority of these were indirect comparisons, confounded by differences in the interventions being compared. Only five studies were found, other than those being conducted by EIRI, that directly compared a parent involvement intervention with a no parent involvement intervention (Barnett, Escobar, & Ravsten, 1988; Henry, 1977; Miller, 1981; Minor, Minor, & Williams, 1983; Scherzer, Mike, & Ilson, 1976). Although these studies report positive effects of parent involvement, research methodology problems existed. In all these studies, parents were trained to provide some type of therapy.

The review by White et al. makes it clear that current beliefs regarding parent involvement in early intervention are not based on a clear research foundation. However, it is a moot point to argue whether parents should be involved, because parent involvement is required by law. Rather, the questions that need to be asked are: "What is the best way to involve parents?" and "What types of benefits are derived from different types of parent involvement?" To begin this type of analysis, different types of parent involvement must be defined and potential benefits elaborated.

Peterson and Cooper (1989) delineated six aspects of parent involvement programs: (1) information provision, (2) professional partnership, (3) support network, (4) training, (5) respite care, and (6) informal contact with staff. For each aspect of parent involvement, a different outcome may be expected. However, Gatling and White (1987), in a review of 172 parent involvement studies, found that over 80% of studies focus on parent training (i.e., training parents as intervenors or therapists for their children) as either the sole or major focus of the parent involvement program. This focus requires data on child outcomes to gauge effectiveness. However, as the above review indicates, available data currently does not allow for empirically based decisions.

The possibility also exists that these six aspects of parent involvement overlap and that even though one aspect may be emphasized, positive outcomes are being realized in other areas of family functioning. For example, if using an ecological model (Bronfenbrenner, 1979; Dunst, 1986), parent involvement activities may affect aspects of family functioning that may impact on the child's later development and functioning (see Blacher, 1984; Kaiser & Fox, 1986), even though immediate child effects may not occur. For example, families of children with disabilities are likely to be highly stressed (Gallagher, Beckman, & Cross, 1983) and in possible need of assistance to continue functioning as a "normal" family unit. Parent involvement activities may reduce this stress. Unfortunately, research on the efficacy of parent involvement programs have not typically included the assessment of possible impact on family functioning, and impacts on these areas are primarily speculative.

As emphasized by the preceding brief review, there are a variety of unclear efficacy issues surrounding parent involvement that require examination. Problems in the parent involvement literature include equivocal effects from studies examining different levels of parent involvement on child developmental progress. Few studies have occurred that are free of treatment confounds, and methodological problems make the results of these studies suspect. Parent involvement has not been clearly defined across studies; although training the parent to act as an intervenor/ therapist for their child is the most common intervention. Finally, most studies have failed to examine family functioning variables. The present study was designed to address these concerns in evaluating the effects of one particular type of parent involvement program.

Overview of Study

The purpose of this study was to investigate the effects of adding one type of parent involvement program to an existing center-based early intervention program. Since all of the children participated in the same center-based early intervention program, but only half of the children had parents who participated in the Parent Involvement program, differences at the conclusion of the study in measures of child and family functioning could be attributed to the presence or lack of the parent involvement component.

The curriculum for the parent involvement component (Parents Involved in Education [PIE]; Pezzino & Lauritzen, 1986) was structured to focus on those aspects that had been used most frequently in past research (i.e., training parents as an intervenor/therapist for their child). Providing parents with information and parent support issues were also included in the PIE, but the primary focus was on teaching parents to provide supplemental therapy to their children with disabilities. Interventions similar to the PIE are commonly offered as an addition to an established early intervention program (Gatling & White, 1987). The present study approached the question of parent involvement by comparing PIE as a supplement to a center-based intervention program versus effects of the center-based program without PIE. This study assessed the impact of these interventions on child progress and family functioning across the time the intervention was in effect, and longitudinally as the child progressed through the educational system.

In addition, this study investigated the issue of whether parent-attended meetings with a training (PIE I) or support-oriented (PIE II) focus were more efficacious (cf., White et al., 1989). Parent support as an appropriate focus for parent intervention activities is receiving attention and interest in recent literature (e.g., Dunst, 1986; Dunst et al., 1988; Hanline & Knowlton, 1988; Zeitlin & Williamson, 1988). However, no comparative information exists on the effect of a parent support intervention on children and families. In order to provide some preliminary information on parent support issues, parents who participated in PIE and whose children remained in the early intervention program for a second year participated in an intervention focused on parent support (PIE II; Durbala & Hollinger, 1988). Although the addition of the parent support component (PIE II) may be effected by the fact that these parents received the PIE I intervention, comparisons with cohorts receiving only PIE I and then receiving only center-based intervention should provide information regarding support as a focus of parent intervention.

Methods

Subjects participating in this study were served through the Des Moines Public School System. The Des Moines public schools serves all children with disabilities in the Des Moines School District from birth through 6 years of age. (The State of Iowa has had a law mandating a free and appropriate public education to children with disabilities from birth through 5 since 1975.) At the time this study was implemented, children with disabilities in the Des Moines Public Schools ages 0-2 were typically served through home-based intervention programs, while preschoolers with disabilities, ages 3-6, typically received intervention services in center-based (classroom) settings. The general philosophy of the Des Moines Public Schools was (and is) to provide high-quality educational services that maximized each child's individual potential. Programs for children were developed based on comprehensive individual assessments conducted by members of a multidisciplinary team. Parents were required to participate in the development of Individualized Education Plans.

Subjects participating in this study were served at the Phillips, Findley, and Perkins schools. This represents three of many neighborhood schools in the Des Moines Public School System in which preschoolers with disabilities were served. These schools were selected because teachers and professional support staff (psychologists, speech therapists, occupational therapists, social workers) who work in these schools were interested in conducting this research study in collaboration with EIRI. The liaison at Des Moines who was responsible for coordinating day-to-day activities of the research study was a school psychologist employed by the school district who had responsibilities at each of the three participating locations.

Subjects. These subjects can be divided into two distinct cohorts (see Figure 8.1). Cohort #1 consisted of those subjects enrolled during the 1986/87 academic year. There were 56 subjects in this cohort (30 control, 26 experimental), 40 of whom were male. The subjects ranged in age from 35 to 72 months at the time they became involved in the research. Cohort #2 consisted of those subjects newly enrolled during the 1987/88 academic year. There were 20 subjects in this cohort (12 control, 8 experimental), 15 of whom were male. Age of subjects in this cohort ranged from 36 to 72 months when intervention began. A subgroup Cohort #1 consisted of those subjects who participated in the research for 2 years. This subgroup consisted of 34 subjects (15 control, 19 experimental), 22 of whom were male. These subjects ranged in age from 35 to 61 months when their participation began.

The subjects were 76 children (42 control, 34 experimental), 55 of whom were male. These subjects ranged in age from 35 to 72 months at the time they began participation in the research. All subjects were identified as being disabled. Approximately 75% of these subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive and language impairments. The degree of disability for all subjects ranged from severe to mild. The majority of subjects were mild to moderately delayed, 55% had developmental quotients (based on the total score of the Battelle Developmental Inventory (BDI)) below 65.

This report will examine data collected through Summer '91 and some of the data collected during Summer '92; this represents data on all subjects through Reassessment #5. Summer '92 data have been collected on Cohort #1 subjects for Reassessment #6 but these are not yet available for analyses.

Reassessment #1 included all subjects from the 1986/87 and subjects newly enrolled from the 1987/88 academic years (see Figure 8.1). All subjects had received one year of intervention at Reassessment #1.

Intervention	n	Fall 86	Spring 87	Fall 87	Spring 88	Summer 89	Summer 90	Summer 91	Summer 92
Cohort 1 a) Only PIE I (Yr. 1)	7	Pre*	Re 1*		Re 2	Re 3	Re 4	Re 5	Re 6
b) PIE I and II (Yr. 1 and 2)	19	Pre	Re 1		Re 2	Re 3	Re 4	Re 5	Re 6
Cohort 2 Only PIE I (Yr. 2)	8			Pre	Re 1	Re 2	Re 3	Re 4	Re 5
Cohort 1 a) No PIE I (Yr. 1)	15	Pre	Re 1		Re 2	Re 3	Re 4	Re 5	Re 6
b) No PIE I or II (Yr. 1 and 2)	15	Pre	Re 1		Re 2	Re 3	Re 4	Re 5	Re 6
Cohort 2 No PIE I (Yr. 2)	12			Pre	Re 1	Re 2	Re 3	Re 4	Re 5

Figure 8.1: Group Assignment Information and Posttesting Schedule by Academic Year for the Des Moines Study

*Pre = Pretest

*Re(#) = Reassessment (number indicating which Reassessment)

Reassessment #2 includes subjects who continued in the early intervention program (15 control, 19 experimental) and subjects who "graduated" to school-age programs (27 control, 15 experimental). Subjects who continued in the program are those who were referred to earlier as the subgroup of the first cohort (Cohort #1b in Figure 8.1). The degree of disability for these subgroup subjects varied, and 60% had developmental quotients (based on the BDI Total Score) below 65. Approximately 70% of these subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive impairments.

At Reassessment #3, all subjects had "graduated" from the intervention program as defined by the research project. At Reassessment #3, approximately 75% of the subjects were in elementary school programs. The remaining subjects stayed in the preschool intervention program. No parent involvement activities, other than those described later in the center-only program, were provided to those who remained in preschool intervention.

Reassessments #4 and #5 include information for Cohort #1 and Cohort #2 children. All children were in elementary school programs at these reassessments.

Recruitment. Parents of children in participating schools who were scheduled for preschool placement at the beginning of the academic year were considered for inclusion in the study if the following criteria were met: (a) One parent was not working or the parent could guarantee time off from work (this was done to help ensure parents had time available to attend parent meetings); and (b) the child was not profoundly retarded (preschool program staff were of the opinion that the needs of parents of these children would not be best met through the PIE). Parents of children at the participating schools who met these criteria were individually approached by preschool program staff. Preschool staff described the research and detailed parent and staff requirements. Placement in study group by random assignment procedures was described. If interested, parents returned an informed consent letter that clarified their requirements for, and potential benefits of, participation, and that stated that assignment to groups would be randomly determined. Approximately 95% of the parents who were approached regarding the research agreed to participate.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups prior to the initiation of treatment, either to a group in which parents received the PIE (Center + PIE) or to a group in which parents received no additional involvement other than what was provided to all parents through the center-based program (Center Only). Both groups continued to receive the same level of center-based services that were previously available through the school's program for preschoolers with disabilities.

To increase the probability of having comparable groups, subjects were randomly assigned to groups after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (35-42 months, 43-54 months, and over 55 months) and level of parent motivation (either "high" or "low") as perceived by each child's teacher. Categorizing subjects in this way resulted in subjects falling into one of six mutually exclusive categories. Within each of the six categories, subjects were rank ordered from low to high based on their scores on the CAPER (Continuum of Assessment Programming, Evaluation, and Resources; Carran, 1983). The CAPER, a teacher-administered test of developmental functioning, had been administered by school personnel at an earlier date.

After subjects were categorized, they were alternately assigned to one of the two conditions. Group determination of the first-listed subject (the subject with the lowest CAPER score) in each age by motivation category was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups based on randomly predetermined sequences. Subjects that participated for 2 years remained in the originally assigned group.

Demographic characteristics. Subjects for this study represented a fairly homogenous sample (see Table 8.1). The majority of subjects were Caucasian males with one sibling. The parents of the subjects were generally in their late 20s or early 30s and had a high school education. The majority of subjects' families were intact, in that both parents lived at home; and traditional, in the sense that the mother was the primary caregiver. English was the primary language for all families. According to family income, the typical family would be considered lower to middle class.

Table 8.1 presents data for subjects who received one year of intervention by group on demographic characteristics. Some discrepancies between the Center-Only and Center + PIE groups are indicated. Mothers of subjects in the Center + PIE group tended to be older than mothers of subjects in the Center-Only group, and they also had higher levels of education. Fathers of Center + PIE subjects were much more likely to hold occupations placing them in higher SES categories. In addition, household income for families of subjects in the Center + PIE group tended to be higher than that for Center-Only subjects' families. Thus, in spite of the random assignment procedures, there was a slight bias in demographic characteristics favoring the Center + PIE group. Variables where such discrepancies occurred were considered as covariates in later analyses.

On measures that present demographic information on fathers, data are presented from a smaller "n" than many other variables. This can be partly attributed to data collection methods. Mothers were the primary providers of demographic and family functioning measures. In the majority of cases where "father data" was not obtained, it was not obtained from families where the father was not living at home. Table 8.1 also presents demographic data on subjects who received Reassessment #2, #3, #4, and #5. Differences between groups noted earlier generally continued from reassessment to reassessment, suggesting a slight bias, based on demographic characteristics, in favor of the Center + PIE group. Also, the number of subjects at each reassessment differs slightly; this will be discussed below.

Table 8.1

Comparability of Groups on Demographic Characteristics for Des Moines Parent Involvement Study

	Reassessment #1								Reassessment #2							
	Center Only			Center + PIE					Center Only			Center + PIE				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES^	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES^
• Age of child in months at pretest	53.0	(11.7)	42	52.3	(11.9)	34	.82	-.06	52.0	(11.5)	37	52.0	(11.8)	33	.93	.00
• Age of mother in years at pretest	28.2	(5.6)	40	30.8	(4.8)	33	.03	.46	28.0	(5.9)	35	31.0	(4.8)	32	.05	.51
• Age of father in years at pretest	30.3	(6.8)	33	33.1	(6.1)	27	.12	.41	31.0	(7.0)	28	33.0	(6.2)	26	.24	.29
• Percent Male*	71.4		42	73.5		34	.84	.05	68.0		37	76.0		33	.46	.22
• Years of Education for Mother	11.4	(2.2)	42	12.7	(1.9)	34	.01	.59	11.7	(1.9)	37	12.7	(2.0)	33	.04	.53
• Years of Education for Father	11.8	(2.2)	32	12.8	(2.6)	31	.13	.45	12.0	(2.3)	27	12.7	(2.7)	30	.25	.30
• Percent with both parents* living at home	66.7		42	70.6		34	.72	.10	65.0		37	70.0		33	.67	.12
• Percent of children who* are caucasian	80.5		41	91.2		34	.19	.41	81.0		36	91.0		33	.23	.40
• Hours per week mother employed	6.6	(12.0)	41	5.1	(11.0)	34	.69	-.13	5.0	(10.2)	36	5.3	(11.2)	33	.91	.03
• Hours per week father employed	32.1	(22.6)	27	33.3	(22.3)	29	.84	.05	34.2	(22.4)	23	33.1	(22.6)	28	.86	-.05
• Percent of mothers* employed as technical/ managerial or above	5.0		40	2.9		34	.66	-.13	6.0		35	3.0		33	.60	-.18
• Percent of fathers* employed as technical/ managerial or above	10.3		29	37.9		29	.01	.84	13.0		24	39.0		28	.03	.77
• Total household income	$14,307	($15,496)	39	$21,632	($18,323)	34	.07	.47	$14,309	($15,840)	34	$22,091	($18,408)	33	.07	.49
• Percent with mother as* primary caregiver	95.0		40	97.1		34	.66	.13	94.0		35	97.0		33	.60	.18
• Percent of children in daycare	35.9		39	35.3		34	.96	-.01	32.0		34	36.0		33	.73	.10
• Number of siblings	1.3	(0.8)	41	1.5	(0.8)	34	.42	.25	1.3	(0.8)	36	1.5	(0.8)	33	.17	.25
• Percent with English* as primary language	100		41	100		34	.99	.00	100		36	100		33	.99	.00

(continued)

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0"

^ $ES = \frac{\bar{X}\ (\text{Center + PIE}) - \bar{X}\ (\text{Center only})}{\text{SD (Center Only)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

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Table 8.1 (continued)

Comparability of Groups on Demographic Characteristics for Des Moines Parent Involvement Study

	Reassessment #3								Reassessment #4							
	Center Only			Center + PIE					Center Only			Center + PIE				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES^	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES^
• Age of child in months at pretest	52.0	(11.9)	37	52.0	(11.3)	31	.90	.00	52.2	(12.0)	37	52.4	(12.0)	34	.96	.02
• Age of mother in years at pretest	28.0	(5.8)	35	31.0	(4.9)	30	.06	.52	28.1	(5.8)	35	30.8	(4.8)	33	.04	.47
• Age of father in years at pretest	31.0	(7.0)	28	32.0	(4.8)	24	.36	.14	30.8	(7.0)	28	33.1	(6.1)	27	.21	.33
• Percent Male*	68.0		37	74		31	.56	.17	67.6		37	73.5		34	.60	.16
• Years of Education for Mother	11.6	(2.0)	37	12.7	(1.8)	31	.02	.55	11.6	(2.0)	37	12.7	(1.9)	34	.02	.55
• Years of Education for Father	11.8	(2.4)	27	12.8	(2.5)	28	.13	.42	11.8	(2.4)	27	12.8	(2.6)	31	.16	.42
• Percent with both parents* living at home	70.0		37	68.0		31	.83	-.07	70.3		37	70.6		34	.98	.01
• Percent of children who* are caucasian	83.0		36	90.0		31	.41	.27	83.3		36	91.2		34	.33	.32
• Hours per week mother employed	5.9	(11.3)	36	5.6	(11.4)	31	.91	-.03	5.9	(11.3)	36	5.1	(11.0)	34	.76	-.07
• Hours per week father employed	32.8	(22.9)	24	34.1	(22.5)	26	.84	.06	32.8	(22.9)	24	33.3	(22.3)	29	.93	.02
• Percent of mothers* employed as technical/ managerial or above	6.0		35	3.0		31	.63	-.15	5.7		35	2.9		34	.56	-.20
• Percent of fathers* employed as technical/ managerial or above	13.0		24	38.0		26	.04	.75	12.5		24	37.9		29	.18	.73
• Total household income	$15,309	($15,916)	34	$21,016	($15,942)	31	.15	.36	$15,309	($15,916)	34	$21,632	($18,323)	34	.13	.40
• Percent with mother as* primary caregiver	94.0		35	97.0		31	.63	.15	94.4		35	97.1		34	.58	.20
• Percent of children in daycare	37.0		35	32.0		31	.68	-.12	37.1		35	35.3		34	.88	-.05
• Number of siblings	1.4	(0.8)	36	1.6	(0.8)	31	.27	.25	1.4	(.8)	36	1.5	(.8)	34	.58	.13
• Percent with English* as primary language	100		36	100		31	.99	.00	100		36	100		34	.99	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0"

^ $ES = \frac{\bar{X}\text{ (Center + PIE)} - \bar{X}\text{ (Center only)}}{\text{SD (Center Only)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

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Table 8.1 (continued)

Comparability of Groups on Demographic Characteristics for Des Moines Parent Involvement Study

	Reassessment #5							
	Center-Only*			Center + PIE				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^
. Age of child in months at pretest	52.3	(11.6)	38	52.6	(12.0)	33	.92	.19
. Age of mother in years at pretest	28.0	(5.8)	36	30.5	(4.6)	32	.05	.43
. Age of father in years at pretest	30.7	(6.9)	29	33.1	(6.1)	27	.18	.35
. Percent Male*	68.4		38	72.7		33	.70	-.08
. Years of Education Mother	11.7	(1.9)	38	12.7	(2.0)	33	.04	.53
. Years of Education Father	12.0	(2.2)	28	12.8	(2.6)	31	.21	.36
. Percent with both parents* living at home	65.7		38	72.7		33	.54	-.14
. Percent of children who are* caucasian	78.4		37	90.9		33	.15	-.31
. Hours per week mother employed	5.8	(11.2)	37	5.3	(11.2)	33	.85	-.04
. Hours per week father employed	34.2	(22.3)	23	33.3	(22.3)	29	.89	-.04
. Percent of mothers* employed as technical managerial or above	6.6		36	3.0		33	.61	.09
. Percent of fathers* employed as technical/ managerial or above	12.0		25	37.9		29	.03	-.56
. Total household income	$14,828	($15,905)	35	$20,015	($15,954)	33	.18	.33
. Percent with mother as* primary caregiver	94.4		36	97.0		33	.61	-.09
. Percent of children in* daycare	37.1		35	33.3		33	.75	.07
. Number of siblings	1.3	(.8)	37	1.5	(.8)	33	.33	.25
. Percent with English as* as primary language	100		37	100		33	.99	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0."

^ $$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

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Table 8.2 (continued)

Child Grade Placement[*] for Each Academic Year by Cohort[**]

Grade	Year Cohort	87/88			88/89			89/90			90/91		
		1a	1b	2	1a	1b	2	1a	1b	2	1a	1b	2
. Preschool		2[•]	32[^]	20[^]	--	13	11	--	2	2	--	--	--
. Kindergarten		15	--	--	3	18	9	--	14	6	--	3	9
. First[$]		--	--	--	14	1	--	3	15	5	--	14	2
. Second		--	--	--	--	--	--	14	1	9	3	14	9
. Third		--	--	--	--	--	--	--	--	--	14	1	--

[*] Data obtained on 69 subjects at end of 1990/91 school year

[**] Cohort 1a = intervention during 1986/87; 1b = intervention 1986/87 and 1987/88, 2 = intervention 1987/88

[^] These children in intervention

[•] These children not in school district preschool program

[$] Children in ungraded placements were placed in grade based on their age and transition from intervention program for this table

Information on child grade placement is presented in Table 8.2. This table presents grade placement information from the time subjects left intervention (1987/88) until 1990/91. Information is presented by cohort (see Figure 8.1)

Attrition. Eighty-six subjects were originally assigned to one of the groups. Of those, 76 subjects completed one year of intervention. All 10 subjects who did not complete one year of intervention were in the Center + PIE (experimental) group (Cohort #1a in Figure 8.1). For all 10 cases, withdrawal from the study was based on parent request to be removed from intervention.

At Reassessment #2, no attrition occurred with those subjects enrolled in intervention for two consecutive years or from Cohort #2 subjects. Of those subjects who "graduated" into the school-age program, six were lost to attrition during Reassessment #2. Five were center-only subjects, and one was a Center + PIE subject. In the Center-only group, one family chose to discontinue participation, one family had moved, one child had recently been institutionalized and permission to test was not obtained, and the parents of two children refused testing at that time. In the Center + PIE group, the parent of one child refused testing at that time.

Eight subjects were lost to attrition at Reassessment #3 (total n = 68). Five of these subjects were from the Center-only group, and three were from the Center + PIE group. The reasons for not testing the Center-only subjects were the same as at Reassessment #2. In the Center + PIE group, the parents of two children refused testing, and one child could not be located. Once again, none of the Cohort #2 subjects were lost to attrition.

At Reassessment #4, 71 subjects were tested. Only 5 children from Cohort #1 were unavailable for testing. All these were Center-only subjects and were the same five that had not been tested during past years. All Cohort #2 subjects were tested.

At Reassessment #5, 71 subjects were tested. Five children were unavailable for testing. Four of these children were center-only subjects, one was a Center + PIE subject. Two of the five center-only subjects who had not been tested at recent reassessments agreed to participate, but one (previously participating) center-only subject's family refused testing. One child in the Center-only group was in foster care and permission to test could not be obtained. The parents of the Center + PIE child refused testing. All Cohort #2 subjects were tested.

Attrition analysis. To examine the effect of subject attrition on the pool of subjects during intervention, attrition analyses on demographic and pretest variables were conducted on the 10 subjects who dropped out during the first year of intervention. Where all attrition occurred in the Center + PIE group, the attrition analysis compared these subjects only with those that remained in the Center + PIE group. These data are presented in Tables 8.3 and 8.4.

Of the 29 variables examined for differences between those subjects who remained in the study and those who dropped out, there was a statistically significant difference on only one pretest score from the Family Support Scale (FSS). Parents who dropped out of the training group reported less support as measured by the FSS.

These analyses indicate that attrition was not systematic and did not bias the outcome of the intervention.

Intervention Programs

The Des Moines Public School System provided educational services to preschool-aged children, ages 3 through 6, who exhibited developmental delays or who had disabilities. These children received center-based (classroom), half-day, 5-day-per-week intervention services. Children received services in educational formats (i.e., large group, small group, and one-to-one) according to their individual needs from special education teachers and teacher associates (paraprofessionals). Language and motor therapists assessed children, provided teachers with objectives, helped teachers integrate instructional therapeutic activities into on-going routines, and provided individualized services as needed. Teachers were free to use various curricula or to develop their own objectives when developing intervention goals and strategies.

The Des Moines Public School Early Intervention Program provided services to a wide variety of children with disabilities, from those exhibiting mild delays to those exhibiting more severe disabilities. The majority of children served were Caucasian, and a wide variety of SES levels were represented. As part of these services to children, parents were regularly involved in IEP meetings; teachers attempted to include and keep parents informed of classroom activities as child and parent needs dictated. In practice, this resulted in regular contacts with parents regarding child progress and participation at IEP meetings, but little else.

The purpose of the research study was to compare the effects of their current service delivery system with the same system enhanced by the inclusion of one type of systematic parent involvement. In both the control and experimental conditions, children received services in the center-based Des Moines Public School Early Intervention Preschool Program. No changes were made to this system for the purposes

Table 8.3

Attrition Analysis on Demographic Characteristics of Subjects Who Remained or Dropped from the Des Moines Parent involvement Study

	Remained♦			Dropped				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^
• Age of child in months at pretest	52.3	(11.9)	34	48.4	(12.5)	10	.37	.32
• Age of mother in years at pretest	30.8	(4.8)	33	28.7	(5.0)	9	.24	.43
• Age of father in years at pretest	33.1	(6.1)	27	35.0	(5.9)	7	.46	-.32
• Percent Male*	73.5		34	80.0		10	.69	-.09
• Years of Education for Mother	12.6	(1.9)	34	12.0	(1.8)	10	.35	.32
• Years of Education for Father	12.8	(2.6)	31	12.4	(3.5)	8	.72	.14
• Percent with both parents* living at home	70.6		34	60.0		10	.54	.30
• Percent of children who are* caucasian	91.3		34	70.0		10	.21	.79
• Hours per week mother employed	5.1	(11.0)	34	6.4	(13.6)	9	.76	-.11
• Hours per week father employed	33.3	(22.3)	29	28.0	(26.8)	5	.64	.23
• Percent of mothers* employed as technical managerial or above	2.9		34	0.0		10	.54	.21
• Percent of fathers* employed as technical/managerial or above	37.9		29	33.3		6	.84	.03
• Total household income	$21,632	($18,323)	34	$27,400	($28,417)	5	.54	-.30
• Percent with mother as* primary caregiver	97.1		34	100.0		9	.46	-.26
• Percent of children in* daycare	3.5		34	4.4		9	.62	-.46
• Number of siblings	1.5	(0.8)	34	1.4	(1.4)	10	.88	.10
• Percent with English as* as primary language	100.0		34	100.0		10	.99	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0."

^ $ES = \dfrac{\bar{x}\text{ (Remained)} - \bar{x}\text{ (Dropped)}}{\text{SD (Pooled)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

♦ All subjects who dropped were in the Center + PIE group. Therefore, only subjects who remained in the Center + PIE groups are used in these comparisons.

Table 8.4

Attrition Analysis on Pretest Measures of Subjects Who Remained or Dropped from the Des Moines Parent Involvement Study

Variable	Remained[*]			Dropped				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Battelle Developmental[*] Inventory (BDI)								
DQs for:								
Personal/Social	67.5	(18.5)	34	61.4	(11.4)	10	.22	.45
Adaptive Behavior	63.1	(22.1)	34	66.9	(10.8)	10	.88	-.06
Motor	62.6	(22.0)	34	68.9	(16.3)	10	.89	-.05
Communication	57.5	(20.6)	34	58.0	(20.2)	10	.69	.14
Cognitive	64.0	(19.6)	34	66.0	(20.0)	10	.62	.18
TOTAL	62.6	(16.7)	34	62.9	(11.7)	10	.66	.16
• Parenting Stress Index (PSI)[♦]								
Child Related (range 30 to 250)	117.4	(18.4)	34	119.0	(15.0)	10	.80	.09
Other Related (range 54 to 270)	131.6	(28.8)	34	122.1	(19.2)	10	.34	-.35
TOTAL (range 101 to 505)	248.9	(43.3)	34	241.1	(29.5)	10	.60	-.19
• Family Resource Scale[♠] (FRS) (range 30 to 150)	116.3	(19.5)	34	117.2	(19.0)	10	.89	-.05
• Family Inventory of Life[♦] Events (FILE) (range 0 to 71)	12.0	(8.0)	34	9.1	(7.4)	10	.32	-.37
• Family Support Scale (FSS)[δ] Total Score (range 0 to 4)	2.2	(0.8)	33	1.7	(0.4)	10	.02	.68

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease in interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing. ES and p value are based on raw scores.

[♠] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[δ] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[^] $ES = \frac{\bar{x}\text{ (Remained)} - \bar{x}\text{ (Dropped)}}{SD\text{ (Pooled)}}$ The sign of the ES is reversed for the PSI, FILE, and FACES, as lower scores are preferred.

[*] All subjects who dropped were in the Center + PIE group. Therefore, only subjects who were in the Center + PIE group are used in these comparisons.

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of the study. Children in the center and parent involvement (center + PIE) intervention were not segregated by classroom or teacher in the center-based service (i.e., all classrooms contained children in both groups). In the experimental group, parents of children enrolled in the early intervention program were exposed to a systematic parent curriculum. In their first year of involvement, parents were involved in the Parents Involved in Education (PIE I) package (Pezzino & Lauritzen, 1986). Parents whose children remained in the program for a second year and were in the experimental group were involved in the Parents Involved in Education II (PIE II) package (Durbala & Hollinger, 1988). A schematic detailing group assignment was presented earlier in Figure 8.1.

Center-only intervention. Children assigned to this group attended an existing center-based, half-day, 5-day-per-week intervention program in which they received small group and individualized teaching sessions from special education teachers and paraprofessional aides. All teachers were certified and were responsible for supervision of their respective aides. None of the aides were certified as teachers. The training for aides consisted mostly of periodic inservices provided by the school district that teachers, aides, and support staff attended, as well as on-the-job training provided by their respective teachers and the collaborating speech and motor therapists. Each class of approximately 10 children had one special education teacher and one aide. Because each child's program was "IEP driven," motor and speech therapists' contact with children varied widely. In general, a motor and speech therapist was present in each class for the equivalent of 1-day-per-week. During a typical day, children were instructed in the motor, speech and language, self-help, cognitive, and social skills areas. As part of the regular services to children, parents were involved in IEP meetings, and teachers provided parents with IEP updates.

The CAPER, along with other curriculum-linked assessment tools, were used in determining intervention goals and strategies. Intervention activities were developed from comprehensive assessments and items drawn from a number of curricula. Teachers were free to select curriculum based on child need. The skill sequences in the curricula used extended beyond the child's current level of functioning, and functional skill training routines were included in the curricula to the degree appropriate.

Center + PIE intervention. In addition to the center-based service described above, parents of children in this group were offered parent meetings organized around the PIE curricula. PIE I training modules were taught by the preschool program support staff and were designed to provide parents with a systematic, conceptual, and hands-on experience in areas such as child development, observation and recording, targeting intervention behaviors, teaching processes, decision making, and communicating with professionals. The training format consisted of small-group lecture, discussion, and demonstrations. The average small group size was between 8 and 12 parents. PIE sessions consisted of 16, 2-hour meetings presented roughly once per week. PIE sessions also included a social support component in which parents had the opportunity to share feelings and express problems, challenges, and other issues associated with their lives. Parents were primarily responsible for determining the agenda for the social support component of the session. This occupied the last 15 minutes of the session and focused on issues such as problems with relatives, finding day care, etc. In addition to these sessions, parents were asked to practice the training activities at home with their children. They were asked to choose a target behavior for the child (such as a self-help or behavioral skill; e.g., compliance, dressing, etc.), implement an intervention program, and measure progress by comparing successful completion of the task before and after the intervention.

Parents whose children remained in the preschool program for a second year continued in a systematic parent intervention, but through a different intervention package. The children continued in appropriate center-based services. Parents attended meetings structured by the *Parents Involved in Education II (PIE II)* curriculum (Durbala & Hollinger, 1988). The PIE II was developed based on a parent needs assessment and focused on parent support issues. Issues addressed included: dealing with parent stress, developing parent communication skills, teaching problem-solving skills, and providing information on areas of interest. The training format for PIE II was the same as PIE I, except 12 sessions were held. Parent home activities that were presented focused on support (e.g., practice parent-focused stress reduction technique, dealing with emotional issues of siblings) rather than child training issues. As in PIE I, a social support component was available at the end of each session.

PIE I and PIE II were conducted by preschool program support staff (e.g., school psychologist, speech and language therapists, consultant, nurse). Classroom teachers and aides were not involved in the PIE meetings and were only indirectly aware of the goals of PIE. Each PIE group was facilitated by a team of two staff members. All parent facilitators received instruction in PIE I and PIE II by their respective developers prior to its initial implementation. Meetings were primarily attended by the children's mothers. Table 8.5 lists session topics for PIE I and PIE II

The intent of the PIE I sessions was primarily to give parents the knowledge and abilities that would enable them to serve as interventionists in the home setting. PIE I was based on the philosophy that child progress can be maximized by training parents as interventionists and that the skills parents learn (i.e., their success as an interventionist) will allow the family to more competently function (i.e., by reducing parent stress and uncertainty). In contrast, although the primary intent was also to provide knowledge, the knowledge gained in PIE II dealt more with information on the effect of a child with a disability on the family, and strategies to normalize the functioning of the family. The philosophy behind this approach ties into the ecological or systems model of development (Bronfenbrenner, 1979; Krauss &

Jacobs, 1991), in that positive changes in the family are expected to have positive effects on each individual family member.

In addition to the PIE, parents in the Center + PIE group were provided the opportunity to attend four sessions conducted by the school nurse. These sessions focused on involvement of both spouses, where possible, and on facilitating communication between families. These sessions were informal in nature and focused on a topic such as a discussion on child nutrition, and on activities (e.g., a family swim night, making gifts at Christmas time).

Impacts on Treatment

During and after intervention, the possibility of uncontrolled events occurring either within or external to the intervention exists. These uncontrolled events can potentially impact on outcome variables. The failure to obtain these types of data can potentially result in an erroneous conclusion (Barnett et al., 1987; Cooke & Poole, 1980). Data that may potentially impact on treatment are frequently included under the rubric of treatment verification (Cooke & Poole 1980). Examples of treatment verification variables include child attendance at the intervention program and parent attendance at the PIE sessions. Data collected in this study encompasses aspects of treatment verification as well as other potential impacts on treatment. These other potential impacts on treatment are referred to as contextual variables. Examples of contextual variables include outside events which may impact on families and intervention services obtained outside of the program under investigation.

This section will examine data obtained on treatment verification and contextual factor variables. For ease of presentation, these treatment verification and contextual factor variables will be referred to as potential impacts on treatment, except in subanalyses that examine a single measure or area.

One year of intervention. Treatment verification/contextual data are presented in Table 8.6 for subjects receiving one year of intervention. Child attendance data for basic services and parent attendance data for parents' training sessions were recorded throughout the year. Child attendance was recorded daily, and parent attendance data (for the Center + PIE group) was recorded weekly; these data were sent to EIRI on a monthly basis. An initial analysis of attendance data indicates no difference in child attendance rates as a function of group placement (Table 8.6). Average attendance for all subjects was 88.2% of possible school days. Average

Table 8.5

Content of PIE I and PIE II

Session	Topic
PIE I	
1.	Introduction and overview
2.	Objective observation of child behavior
3.	Defining and measuring behavior
4.	Principles of behavior management
5.	Analyzing behavior chains
6.	Theories of child development
7.	Testing and assessment
8.	Criterion-referenced assessment
9.	Developing learning objectives
10.	P.L. 99-457 and IEPs
11.	Intervention strategies
12.	Factors related to teaching success
13.	Practice teaching session
14.	Determining appropriate interventions
15.	Communicating with professionals
16.	Review, comments, concerns, questions
PIE II	
1.	Parent needs assessment and introduction
2.	Child development and behavior management
3.	Stress reduction
4.	Strategies for improving social and language skills
5.	Strategies for improving self-help and cognitive skills
6.	Communication
7.	The grief process
8.	Community services
9.	Feelings of siblings and extended family members
10.	Understanding my child's rights: Dialogues with professionals
11.	Promoting family fun
12.	Review, questions, and evaluation

attendance by parents at the training sessions was 47.6% of all PIE classes for all parents. Fifty-seven percent of parents attended between 5 and 11 classes; only 13% of parents (5 parents) attended more than 75% of the time. These absences occurred in spite of repeated attempts by program staff to encourage regular attendance. The local site coordinator regularly called absent parents to promote attendance. These data pertain only to PIE I.

A description of quality of parent involvement was also gathered annually from a direct intervenor (teacher) who worked most closely with the respective parent. The data obtained was the intervenor's perception (low, average, high) of how a parent rated on attendance, knowledge, and support. These data are presented in Table 8.6. Teachers rated parents in the Center + PIE group as having a higher quality involvement with the school program. This occurred although teachers were not directly informed of child group placement (although information could have been shared by parent and teacher or indicated through other cues).

In addition to the intervenor's rating of parents, parents were asked to rate their satisfaction with the program (see Table 8.6). Parents rated the intervention program on seven questions that assess satisfaction in a variety of areas (e.g., staff, participation, communication, etc.). Parents in both groups were equally satisfied with the center-based program.

Health data on each child were also obtained. Data on hospitalizations (and length), days with fever, a general health rating of the child, and other factors were collected. Data on child general health are presented in Table 8.6. No differences between the study groups were found on any of the health measures.

Teachers in Des Moines were also evaluated annually by their immediate supervisor. These data are relevant to treatment verification. Teachers were rated by their supervisor either as being satisfactory or as needing training. The Des Moines School District uses only two rating levels as per an agreement with the local

Table 8.6

Treatment Verification/Contextual Data for Subjects Receiving One Year of Intervention for Des Moines Study

Variable	Center-Only			Center + PIE			p Value	ES♦
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
Treatment Verification								
• Average length of intervention in program days	134.7	(29.0)	42	133.1	(31.8)	34	.83	.06
• Percent child attendance	87.3	(7.9)	38	90.0	(6.6)	34	.13	.34
• Parent PIE attendance	---	---	---	47.6	(22.0)	34	---	---
• Additional Services received* outside the intervention program								
Percent receiving outside** speech therapy	7.3		41	9.1		33	.79	.12
Percent receiving outside** motor therapy	7.3		41	6.1		33	.83	-.05
Contextual Variables								
• General health of child&	2.0	(0.5)	39	1.9	(0.7)	32	.66	-.20
• Teacher rating of parents#	5.3	(2.0)	40	7.0	(1.9)	34	.00	.85
• Parent satisfaction^	24.9	(2.5)	29	25.1	(2.9)	26	.73	.08
• Family Resource Scale	121.5	(17.0)	41	117.7	(18.9)	34	.36	-.22
• Percent with two parents** living at home	47.6		42	73.5		34	.02	.64
• Family income	14,397	(15,597)	39	22,147	(18,734)	34	.06	.50

& Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

^ Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28). Higher scores indicate greater satisfaction.

Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

* Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

♦ $$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

** Statistical analyses for these variables were based on a t-test where those receiving services were scored "1" and those not receiving services "0." Effect sizes are based on a probit transformation of percentage data.

teachers' union, and no other evaluations can be conducted as per the contract. All teachers of subjects involved in this study received a satisfactory rating.

Additionally, information was obtained at posttest on the amount of time each child spends in various activities/therapies such as daycare, speech therapy, etc.

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outside of the intervention program. The data for the two most frequently occurring additional services are presented in Table 8.6. No group differences were found.

Contextual data on parents' perception of family resources (based on the Family Resource Scale), and information on family income and if two parents were living in the home at Reassessment #1, are presented in Table 8.6. A statistically significant difference was found on two parents in the home and faily income. These variables were considered as covariates in later analyses but did not correlate with outcome variables. No differences were found on the other measures.

Two years of intervention. Treatment verification/contextual data for subjects receiving two years of intervention (see Figure 8.1) are presented in Table 8.7. These data are presented by first and second year of intervention. Variables on which these data were obtained were discussed previously and will not be repeated. The groups were not significantly different on any of these variables in either year.

Parent satisfaction data obtained after the second year of intervention were different than those obtained earlier. Satisfaction questions focused on the parents involvement in, and understanding of, the child's educational program. This was done in an attempt to make the satisfaction questionnaire more sensitive to aspects of parent involvement. The data presented in Table 8.7 indicate no group differences using this new questionnaire.

Average attendance at parent training sessions during the first year of intervention ranged from 2 to 13 of 16 possible PIE I sessions, with a mean of 7.8 sessions (SD = 3.0). During the second year, of 12 PIE II sessions, parents attended from 0 to 12 sessions with a mean of 4.6 sessions (SD = 4.4). Regular parent contacts were made to nonattending parents in an attempt to increase attendance.

The concern that the Center + PIE I + PIE II subgroup of the Center + PIE group might have been different from the other parents in the Center + PIE group that received only PIE I was a concern that arose in relation to attendance at parent

Table 8.7

Treatment Verification/Contextual Data for Subjects Receiving Two Years of Intervention Presented by First and Second Year of Intervention for the Des Moines Parent Involvement Study

	First Year								*Second Year*							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES♦
Treatment Verification																
• Percent child attendance	88.3	(7.3)	12	89.0	(6.1)	19	.77	.10	88.4	(5.6)	14	88.9	(11.3)	18	.89	.09
• Additional Services* received outside the intervention program																
Percent receiving** outside speech therapy	0.0		15	5.2		19	.71	.13	0.0		12	17.8		17	.28	.38
Percent receiving** outside PT/OT therapy	6.7		15	0.0		19	.72	-.25	0.0		12	0.0		17	---	.00
Contextual Variables																
• General health of child^	1.9	(0.5)	15	1.8	(0.8)	18	.89	-.20	1.9	(0.7)	14	1.8	(0.6)	18	.69	-.14
• Teacher rating of parents#	6.4	(1.9)	14	7.2	(1.9)	19	.25	.42	7.1	(1.7)	14	8.0	(1.4)	16	.11	.53
• Parent satisfaction+	25.0	(2.2)	14	24.9	(3.1)	19	.91	-.05	26.7	(3.0)	7	26.3	(5.5)	15	.84	-.13
• Family Resource Scale	121.1	(18.0)	15	117.3	(22.2)	19	.59	-.21	124.1	(17.0)	14	118.3	(27.6)	19	.50	-.34
• Percent with two** parents living at home	53.3		15	79.0		19	.12	.64	60.0		15	68.4		19	.62	.21
• Family income	20,346	(21,665)	13	25,868	(20,509)	19	.47	.25	23,167	(26,843)	12	27,656	(21,894)	16	.63	.17

^ Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

+ Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28) in the first year. In the second year, satisfaction is based on the sum of eight questions that deal with aspects of satisfaction related to the parents participation in the child's educational program (range = 8 to 32). Higher scores indicate greater satisfaction.

Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

"---" = t-test not conducted because of no variance.

♦ $$ES = \frac{\bar{X}\text{ (Center + PIE)} - \bar{X}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

** Statistical analyses for these variables were based on a t-test where those receiving services were scored "1" and those not receiving services "0." Effect sizes are based on a probit transformation of percentage data.

meetings during the first year. A t-test between these two subgroups was completed on attendance at PIE I meetings, and no difference in attendance was found (t = 1.08, p = .29).

Site review. One source of treatment verification data is information from a site review conducted annually by the site coordinator. The first site review was conducted on April 10, 1987, and a second site review was conducted on May 10 and 11, 1988. The purposes of these reviews were to: (a) collect information about the nature and quality of early intervention services that were being delivered, (b) verify that the research being conducted by EIRI was being implemented as intended, and (c) collect assessment data that may have been useful to site administrators to guide internal changes and for use when seeking technical assistance.

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Purposes (a) and (b) are of primary interest in this report. The Des Moines School District was conducting the research as intended by EIRI. Overall findings indicated that: the preschool program was of high quality; it was staffed by enthusiastic and qualified professionals; classroom environments were safe and appropriate; teachers emphasized functional skills in naturally occurring environments; the program was competently administered, used up-to-date curricula, and had proper evaluation, assessment, and progress procedures; parent training sessions were well organized and well facilitated; and parent participation was good. (For more information, a copy of the site reviews can be obtained.)

Family life events. Life events that occur to a family prior to, during, and after intervention are contextual factors that may also potentially impact on outcome data. To examine this possibility, the Family Inventory of Life Events and Changes (FILE) (McCubbin et al., 1983) was administered at Pretest and Reassessment #1 and #2 (see Tables 8.12 and 8.14 for a description of this measure). This measure was discontinued after Reassessment #2 based on parent request.

The data obtained from the FILE are presented in Table 8.8. These data do indicate that the families in the Center + PIE group were experiencing significantly more life events; a factor which may impact on treatment.

Table 8.8

Family Life Events Scores for Des Moines Parent Involvement Study

	Center-Only			Center + PIE			
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value
Pretest*	8.1	(4.8)	41	12.0	(8.0)	34	.02
Reassessment #1*	7.4	(5.3)	41	10.8	(6.9)	34	.02
Reassessment #2*	6.1	(5.0)	24	9.7	(7.4)	25	.05
Reassessment #5**	24.6	(55.8)	36	41.5	(56.2)	31	.22

* FILE, range = 0 to 71
** Major Life Events Scale, range = 0 to 457

These results clearly indicate the differential occurrence of family life events. This finding was considered when conducting outcome analyses and the use of the FILE as a covariate was examined. The FILE did not correlate significantly with child outcome variables, nor with the majority of family functioning variables (see Results and Discussion section for more information).

Although the FILE was not administered at Reassessment #3 or #4, the Holmes and Rahe Major Life Events Scale (Holmes & Rahe, 1967) (see Table 8.14 for a description of this measure) was administered at Reassessment #5 to gather additional information on longitudinal aspects of life events, and the results of analysis on this measure are presented in Table 8.8. No statistically signiicant differences were found at Reassessment #5 on the Main Life Events Scale for negative life events (the data are presented in Table 8.7) or on stress related to these life events ($\underline{p} = .50$).

Post intervention data. It is important to assess events, which happen to children and families following intervention, that may impact on outcome measures being used. The data collected on these events, although no longer measures of treatment verification, may be important to the appropriate interpretation of longitudinal data. All data collected post-intervention will be referred to as contextual factors.

Data collected post intervention consisted of information regarding the child's health and information regarding services the child received outside of those provided by school placement. (Hours of outside services data were not available for Reassessment #4.) These data are presented in Table 8.9. Some demographic variables and perceptions of family resources may potentially impact on outcome measures; these are also presented in Table 8.9. All post-intervention data were obtained from parent report at each reassessment.

No differences were found between groups in the health of the subjects for any of the reassessments on any of the health variables examined. In terms of extra therapies received by subjects, a difference occurs in the amount of speech therapy

Table 8.9

Contextual Data for Reassessment #2, #3, #4, and #5 for Des Moines Parent Involvement Study

	Center-Only			Center + PIE				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
REASSESSMENT #2								
• Average number of[♦] Intervention Days	197.2	(82.1)	87	220.8	(77.4)	33	.22	.29
• General health of child[&]	1.9	(0.6)	26	1.9	(0.5)	26	.66	.00
• Therapies received outside[*] school program								
Percent receiving outside[**] speech therapy	8.8		34	22.6		31	.13	.52
Percent receiving outside[**] PT/OT therapy	2.9		34	3.2		31	.95	.04
• Family Resource Scale*	124.8	(14.6)	35	114.4	(24.8)	33	.02	-.71
• Percent with two parents[**] living at home	51.4		37	66.7		33	.20	.37
• Family Income*	16,800	(19,316)	30	23,690	(19,366)	29	.18	.36
REASSESSMENT #3								
• General health of child[&]	2.1	(0.5)	36	2.0	(0.7)	31	.45	-.20
• Therapies received outside[*] school program								
Percent receiving outside[**] speech therapy	0		25	17.0		23	.00	.95
Percent receiving outside[**] PT/OT therapy	0		25	8.7		23	.04	.61
• Family Resource Scale*	122.7	(12.8)	37	120.3	(23.9)	31	.60	-.19
• Percent with two parents[**] living at home	50.0		36	61		31	.36	.27
• Family Income*	15,757	(18,029)	35	22,000	(18,278)	30	.17	.35

(continued)

[&] Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[*] Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

"__________" = no data available

[^] $$ES = \frac{\bar{X}\text{ (Center + PIE)} - \bar{X}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

[**] Statistical analyses for these variables were based on a t-test where those receiving services were scored "1" and those not receiving services "0."

[♦] Data represent days in center-based preschool program combined across Reassessment #1 and #2.

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Table 8.9 (continued)

Contextual Data for Reassessment #2, #3, #4, and #5 for Des Moines Parent Involvement Study

Variable	Center-Only $\bar{x}$	Center-Only (SD)	Center-Only n	Center + PIE $\bar{x}$	Center + PIE (SD)	Center + PIE n	p Value	ES[^]
REASSESSMENT #4								
• General health of child[&]	2.1	(0.6)	34	2.1	(0.5)	32	.97	.00
• Therapies received outside[*] school program								
Percent receiving outside[**] speech therapy	—	—	—	—	—	—	—	—
Percent receiving outside[**] PT/OT therapy	—	—	—	—	—	—	—	—
• Family Resource Scale*	124.4	(14.8)	35	119.0	(22.8)	32	.25	-.36
• Percent with two parents[**] living at home	55.6		36	61.8		34	.60	.15
• Family Income*	18,186	(19,537)	35	22,081	(19,175)	31	.42	.20
REASSESSMENT #5								
• General health of child[&]	2.1	(0.5)	25	2.2	(0.7)	25	.42	.20
• Therapies received outside[*] school program								
Percent receiving outside[**] speech therapy	5.4		37	6.1		33	.91	.06
Percent receiving outside[**] PT/OT therapy	5.4		37	3.0		33	.63	-.15
• Family Resource Scale*	124.9	(16.2)	35	121.0	(20.0)	31	.39	-.24
• Percent with two parents[**] living at home	55.3		38	72.7		33	.13	.44
• Family Income*	16,066	(17,418)	38	24,895	(25,170)	33	.09	.51

[&] Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[*] Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

"————" = no data available

[^] $ES = \frac{\bar{X}\text{ (Center + PIE)} - \bar{X}\text{ (Center Only)}}{\text{SD (Center Only)}}$

[**] Statistical analyses for these variables were based on a t-test where those receiving services were scored "1" and those not receiving services "0."

subjects received outside of school. Subjects in the Center + PIE group received more speech therapy as reported at Reassessment #3, but not at Reassessment #2 or #5. No differences between groups were found in motor therapies received at any posttest except at Reassessment #3. These data suggest that Center + PIE subjects may have had a slight advantage over the Center-only subjects at Reassessment #3 in communication and motor skills because of extra therapy received. Statistically significant differences were found at different times on the perceptions of family resources and on the contextual demographic variables. Their fluctuation suggest that impacts were consistent across reassessments.

Test of parent knowledge. A treatment verification variable was a test of parent knowledge administered to parents at all reassessments. The test of parent knowledge was designed as part of PIE I and assessed the degree to which parents learned the concepts taught in PIE I. The test consisted of 30 multiple choice questions and higher scores indicated greater retention of concepts.

Initial analyses (t-tests) of data from the test of parent knowledge indicated that parents in the Center + PIE group obtained statistically significantly higher scores than the Center-only group at all reassessments. The test of parent knowledge results were reanalyzed to examine differences between parents who received intervention for one year (Center + PIE I) vs. two years (Center + PIE I + PIE II). Oneway analyses of variance were conducted between these two experimental subgroups and the center-only group. These data are presented in Table 8.10. Statistically significant differences were found at all reassessments. A Student-Newman-Keuls procedure was conducted to determine specific group difference. The Center + PIE I + PIE II cohort performed better than the control group at all reassessments. The Center + PIE I cohort performed better than the control group at Reassessments #1 and #3. The center + PIE I + PIE II group performed better than the Center + PIE group at Reassessments #2 and #4.

These results suggest that the longer parents remained in intervention, the better their recall for concepts and information taught during PIE I, and that those who received PIE intervention had more knowledge of the intervention subject matter than those who had not received the PIE intervention. This finding is consistent

Table 8.10

Test of Parent Knowledge[*] Scores for Des Moines Parent Involvement Study

	Center Only			Center + PIE I			Center + PIE I + PIE II				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	Direction[+]	p Value
Reassessment #1	8.6	(4.2)	41	13.9	(5.9)	15	17.2	(5.4)	19	0 < 1 0 < 2	.000
Reassessment #2	10.1	(6.0)	35	12.7	(5.6)	14	17.3	(7.1)	18	0 < 2 1 < 2	.001
Reassessment #3	9.1	(5.3)	37	14.2	(5.8)	13	17.9	(7.2)	18	0 < 1 0 < 2	.000
Reassessment #4	10.0	(5.4)	36	12.7	(5.7)	14	17.3	(7.7)	18	0 < 2 1 < 2	.001
Reassessment #5	9.6	(6.2)	34	12.0	(5.0)	12	18.5	(7.3)	17	0 < 2 1 < 2	.001

[*] Range = 0 to 30

[+] Indicates direction of significance based on SNK procedure; 0 = Center-Only, 1 = Center + PIE, 2 = Center + PIE I + PIE II.

with the goals of the PIE intervention and suggests that the PIE intervention was effective in this aspect of knowledge provision. The fact that parents who received two years of PIE intervention recall more information than those only receiving one year of intervention is also consistent with expected intervention outcomes. Although PIE II was different in overall intent, it did provide parents with a forum to use information learned in PIE I.

Treatment verification analyses. An analysis of the treatment verification data was conducted. The finding of group differences on the intervenor rating of parents (Table 8.6) raised questions regarding the reason for this difference. That is, did the PIE intervention provide parents with skills that enabled them to interact more effectively with teachers, or were the ratings the result of other factors (as pretest differences did exist between groups)? The relation of parent attendance at group meetings (by Center + PIE group parents) and parent satisfaction with intervenor ratings were other issues that were of interest.

Correlational analyses were conducted to begin the examination of these issues. Correlations of parent attendance (by Center + PIE group parents), intervenor ratings of parents (for all parents), and parent satisfaction (for all parents) with treatment verification measures, family demographic characteristics, and information from posttest family measures were conducted. Correlations with family measures and the majority of demographic characteristics revealed no significant correlations. Data presented in Table 8.11 represent correlations that provide some interesting findings regarding the current data and raise suggestions for further analyses. Intervenor ratings of parents appear influenced by a number of factors, primarily parent education and income; although child attendance at school and lack of child

Table 8.11

Correlational Analyses of Treatment Verification Data For Des Moines Parent Training Study

	Parent Attendance*		Intervenor Rating^		Parent Satisfaction#	
Variable	r	p	r	p	r	p
• Mother's education	.32	.07	.56	<.000	.11	.25
• Father's education	.37	.05	.51	<.000	-.03	.41
• Family income	.42	.03	.61	<.000	.15	.17
• Child school attendance	.22	.10	.23	.06	.04	.40
• Parent attendance*	—	—	.55	.002	.00	.50
• Intervenor rating^	.55	.002	—	—	.06	.33
• Parent satisfaction#	.00	.50	.06	.33	—	—
• Child progress+	-.12	.26	-.20	.06	.04	.38

* Based on actual parent attendance at PIE I meetings.

^ Based on the sum of three questions assessing parent support, knowledge, and attendance as perceived by the teacher at Reassessment #1.

Based on seven questions assessing parent satisfaction obtained at Reassessment #1.

+ Child progress is based on difference in BDI total raw score from Pretest to Reassessment #1.

progress in school also was related to intervenor ratings. When these demographic factors were included in an Analysis of Covariance with intervenor rating (sum of the three areas) as dependent variable and treatment group as independent variable, no differences between groups were found ($F = 2.46$, ES = 0.38, $p = .13$).

Parent education and income was also associated with parent attendance at PIE meetings. Perhaps parents with higher levels of education are more comfortable in a class-like setting and are more willing to attend regularly. Unlike parent attendance at meetings and intervenor ratings, parent satisfaction with the Center-Based intervention program is unrelated to parent education, child progress, or intervenor perception. A number of possibilities arise: (a) more sensitive measures of satisfaction may be needed; (b) parents may not have a clear idea of what represents a good versus poor program; or (c) parents may be truly satisfied.

These treatment verification analyses raise interesting questions for the field of early intervention. Evaluations in the past have overlooked these variables and as a result may have obtained biased data (Casto & Mastropieri, 1986; Cooke & Poole, 1982). These initial analyses make clear the importance of verification data. Verification data cannot only help clarify results obtained, but also raise new areas for investigation.

Cost of Alternative Interventions

The cost of the basic center-based program and the center-based + PIE I and PIE II programs, as described above, was determined using the ingredients approach (Levin, 1983). Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, transportation, materials and supplies, and contributed resources. The cost of the center-based plus PIE I and center-based plus PIE II is simply equal to the cost of the basic center-based program available to 210 children (all center-based enrolled preschool children) plus the additional cost of PIE I or PIE II for those families who participated in 1987-88. The cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each program. Table 8.12 presents the cost per child in each of these resource categories. All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1991).

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to each program. Because the program is operated within a public school system, school and general direct administration were included. Occupancy charges included the annual rent for the facility in which the program was housed, all utilities, insurance, and maintenance costs. Equipment costs were based on estimates of the market replacement value of all classroom and office equipment, annualized to account for interest and depreciation. Staff transportation costs for job-related travel were based on actual mileage at $.21 per mile. The average cost per child for children in special education in the school district was used for child transportation costs. The cost for materials and supplies included the annual expense to the program for all consumable items.

Contributed resources included the value of parent time working at home with their children, attending training sessions, and the time and expense of driving to the sessions. Parents in the PIE I group spent an average of 16.5 hours and PIE II parents spent an average of 9.32 hours in training sessions, and, assuming that parents followed PIE curriculum requirements, 60 hours working at home with their child. In addition, parents in both groups were interviewed via telephone to determine their transportation expenses to attend sessions. These costs were assigned the opportunity cost of $9 per hour; mileage was assessed at $.21 per mile.

Table 8.12
Cost Per Child for Des Moines Study

Resource	Center-Based Only	Center-Based + P.I.E. PIE I	Center-Based + P.I.E. PIE II	Average PIE
Agency Resources				
Direct Service Personnel	$4,214	$5,749	$4,645	$5,197
Administrative Personnel				
Preschool	247	247	247	247
District	1,284	1,284	1,284	1,284
Facilities	224	224	224	224
Equipment	33	33	33	33
Materials/Supplies	40	85	54	70
Transportation				
Child	501	501	501	501
Staff	36	36	36	36
Subtotal	$6,579	$8,160	$7,024	$7,592
Contributed Resources				
Parent Transportation	0	91	54	72
Parent Time	0	772	698	734
Total	***$6,579***	***$9,023***	***$7,776***	***$8,398***

Data Collection

It is important to note that the data collected for this study were collected to assess the effects of intervention not only on the children, but also on their families. As noted earlier, pretest data and data from Reassessment #s 1, 2, 3, 4, and 5, and some data for Reassessment #6 have been collected. The instruments used to obtain data on children and their families, and the posttest administration information on these instruments is presented in Table 8.13. A brief description of each of these instruments is presented in Table 8.14.

Recruitment, training, and monitoring of diagnosticians. Initially, diagnosticians were doctoral candidates in the School Psychology program at Iowa State University and other professionals in the community (i.e., speech/language therapists and teachers). Their training involved approximately 4 hours of independent study and 8 hours of

Table 8.13

Schedule of Administration and Tests Administered for Des Moines Parent Involvement Study

	Pretest	Reassessment #1	Reassessment #2	Reassessment #3	Reassessment #4	Reassessment #5	Reassessment #6
CHILD MEASURES							
Battelle Developmental Inventory	X	X	X	X			
Woodcock-Johnson Tests of Achievement					X	X	X
Scales of Independent Behavior					X	X	X
Joseph Preschool and Primary* Self-Concept Inventory		X	X	X	X		
Stanford-Binet Intelligence** Test Form L-M		X					
Developmental SPECS					X		
Harter Perceived Self-Competence Inventory						X	X
Social Skills Rating System						X	X
FAMILY MEASURES							
Parenting Stress Index	X	X	X	X	X	X	
Parenting Stress Index Short Form							X
Family Support Scale+	X	X	X		X	X	X
Family Resource Scale	X	X	X	X	X	X	X
Family Inventory of Life Events+ and Changes	X	X	X				
Family Adaptability and Cohesion Evaluation Scales	X	X	X	X	X	X	
CES-D Depression Scale		X	X	X			
Child Improvement Questionnaire		X	X	X	X	X	
Parent as a Teacher Scale*			X	X	X		
Comprehensive Evaluation of Family Functioning						X	
Parent Self-Awareness Scale						X	X
Holmes and Rahe Major Life Events						X	X
Family Functioning Style Scale							X

* At Reassessment #1, this test was administered to Cohort 2 subjects. This test was not included in the test battery until 1988.

** This test was administered at Reassessment #1 to Cohort 1 subjects only. The costs for administering this test were very high and the information being generated did not substantially add to that which was being otherwise collected.

+ At Reassessment #2, these were completed only for Cohort 1 subjects due to an error caused by the staggered testing of cohorts.

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Table 8.14

Description of Tests Administered for Des Moines Parent Involvement Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Woodcock-Johnson Tests of Achievement (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of nine aspects of scholastic achievement: Letter-word Identification, Passage Comprehension, Calculation, Applied Problems, Dictation, Writing Samples, Science, Social Studies, and Humanities.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1984)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: motor skills, social and communication skills, personal living skills, and community living skills.
Joseph Preschool and Primary Self-Concept Screening Test (JSI) (Joseph, 1979)	Assesses the self-concept of children ages 3.6 to 9.11 years via responses to line drawings. It provides a global self-concept score.
Stanford-Binet Intelligence Test Form L-M (Terman & Merrill, 1973)	The Stanford-Binet is a norm-referenced measure of general intellectual ability.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: communication, sensorimotor, physical, self-regulation, cognition, and self-social.
Social Skills Rating Scale (SSRS) (Gresham & Elliott, 1990)	A norm-referenced measure of child social skills and school success. Ratings are obtained from the child's parent and teacher.
Harter Perceived Self-Competence Scale (Harter & Pikes, 1983)	A pictorial scale of perceived competence and social acceptance for young children that assesses four domains: cognitive competence, physical competence, peer acceptance, and maternal acceptance.
FAMILY MEASURES	
Parenting Stress Index Short Form (PSI-SF) Abidin, 1990)	This is a short version of the PSI. Three factors are assessed: maternal self-esteem, parent-child interaction, and child self-regulation.
Parent Stress Index (PSI) (Abidin, 1986)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.

(continued)

Table 8.14 (continued)

Description of Tests Administered for Des Moines Parent Involvement Study

MEASURES	DESCRIPTION
Family Adaptability and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
CES-D Depression Scale (Radloff, 1977)	This scale is a short self-report test designed to measure depression-symptomatology on the general population.
Child Improvement Questionnaire (Devellis et al., 1985)	The questionnaire has been adapted from the Child Improvement Locus of Control (CILC). The CILC assesses parental perceptions of factors that affect the progress of their developmentally impaired child. Factors assessed are: chance, efforts by professionals, the child's efforts, parent efforts, and divine intervention.
Parent as a Teacher Scale (PAAT) (Strom, 1984)	Assesses parent attitudes toward aspects of the parent-child interactive system. The PAAT responses are grouped into five areas: creativity, frustration, control, play, and teaching-learning.
Comprehensive Evaluation of Family Functioning (CEFF) (McLinden, 1989)	Assesses areas in which a family having a child with special needs may be affected. Areas assessed are: time demands, acceptance, coping, social relationships, financial demands, well-being, and sibling relationships.
Parent Self-Awareness Scale (PSAS) (Snyder, Weildreyer, Dunst, & Cooper, 1985)	Assesses parent perceptions of empowerment in the areas of decision making, obtaining information, and in interactions with self and others.
Holmes & Rahe Major Life Events (Holmes & Rahe, 1967)	Assesses parent stress resulting from major life events that occurred within the past year.
Family Functioning Style Scale (FFSS) (Deal, Trivette, & Dunst, 1988)	The scale is a 26-item scale that assesses the extent to which the person (i.e., mother) believes that their family is characterized by different strengths and capabilities.

group training. Each examiner, after administering a minimum of three practice BDIs, was required to pass a quality-control test administration before they were permitted to test. Further, approximately 10% of each examiner's test administrations were "shadow scored" during each testing period. Interrater reliability data on the BDI reveal coefficients consistently above .90. All test protocols were also rescored by EIRI clerical staff and errors indicated. This rescoring has resulted in only minor errors being discovered, increasing confidence in the examiners. These examiners also administered the Peabody Picture Vocabulary Test (PPVT) to mothers. This was done concurrent with the Reassessment #1 BDI administration. None of the examiners had any involvement with the Des Moines School District program, so the likelihood of their knowing to which group a child was assigned was remote.

All Stanford-Binets were administered by three trained doctoral candidates in the Psychology program at Utah State University. All Stanford-Binet examiners were uninformed about the subjects' group assignments. None of the Stanford-Binet examiners had any other involvement with EIRI or the Des Moines Public Schools, so the likelihood of their knowing group assignments was also remote. The Stanford-Binet was administered while the child was in his preschool classroom placement.

During the Spring 1988 reassessment, the Joseph Preschool and Primary Self-Concept Inventory (JSI) was added as a measure. BDI examiners were trained in the administration of the JSI. Two examiners administered all JSIs (in 1988) to children while they were in the classroom placement. In following years, the JSI was administered with the other child measures.

At Reassessment #4, two BDI examiners were trained in the use of the Woodcock-Johnson Tests of Achievement and the Scales of Independent Behavior. Certification requirements for administering these tests was the same as those established for the BDI. The mean interrater reliability on these instruments for Reassessment #4 was 97.9%. These two examiners also completed Reassessment #5 testing. In addition, a third diagnostician was trained. The mean interrater reliability on these instruments at Reassessment #5 was 98.6%. These three examiners have conducted all Reassessment #6 testing to date.

Administration of family measures has varied. At pretest, Reassessment #1, and for some subjects at Reassessment #2 (see second reassessment below), the measures were administered to parents while in a group by the site liaison. Parents were not allowed to discuss these measures during the session (except for individual questions to the liaison) and parents were requested not to discuss this information with other parents. This method of administration was selected to help ensure that examiners remained "blind" to subject group placement.

For some subjects in Reassessment #2, and for subsequent reassessments, parents completed family measures during and following the time child measures were being administered. Examiners were familiarized with procedures to be followed for the family measures and with the individual measures.

Pretest. The following procedures were completed at pretest. Parents of each child participating in the study completed an informed consent form and provided demographic information. In the first of two pretesting sessions, parents (usually the mother) completed the family measures. In a second pretesting session, which took place within 2 weeks of the first session, children were administered the Battelle Developmental Inventory (BDI). Parents were paid $20 after both pretesting sessions were completed.

First reassessment. At the first reassessment, a similar course of events occurred. Family measures were administered in one session and child measures during another session (see Table 8.11). At this and all subsequent reassessments, demographic information was updated and parents provided information relevant to treatment verification. At this posttest only, mothers were administered the Peabody Picture Vocabulary Test--Revised (Dunn & Dunn, 1981). Parents were paid for participating in reassessment activities. Payment was provided at all subsequent reassessments.

Second reassessment. At Reassessment #2, events differed slightly depending on whether children were enrolled in the preschool intervention program or a school-age program. Children in the preschool intervention program were tested in the same manner as Reassessment #1. Parents and children in the school-age program were tested during a single session. This change from two to one session for reassessment activities was the only different aspect of the process.

Third reassessment. At Reassessment #3, all measures were administered using the single session format.

Fourth reassessment. The format for Reassessment #4 activities was the same as that described for Reassessment #3. At Reassessment #4, the BDI was no longer used. The mean age for subjects at this posttest was 94 months. The BDI is inappropriate for children at this age level. A number of ceiling problems had been noted on the BDI at Reassessment #3. Child measures were changed at this point for all subjects (see Tables 8.13 and 8.14). In addition, information was obtained from each child's teacher on classroom placement and the teacher's judgment of child skills (SPECS). Parent permission to contact teachers was obtained. Teachers were mailed forms to be completed with appropriate descriptive information. Teachers were remunerated for their participation.

Fifth reassessment. Although the Woodcock-Johnson and SIB continue to be used, the JSI and SPECs were replaced by the Perceived Self-Competence Inventory and SSRS. These changes reflect the increasing ages of the children. The SSRS is completed by both the parent and teacher. Some changes in family measures have also occurred (see Tables 8.13 and 8.14). These changes result in no loss of information, but instead use new instruments to obtain equivalent information. These changes reflect study sensitivity to parental input, results from data obtained on earlier measures, and the increasing age of children. Teacher information was again obtained.

Sixth reassessment. Reassessment activities mirror those of the fifth reassessment. Some changes occurred in family measures (see Tables 8.13 and 8.14). Teacher information will be obtained.

Cross-reassessment issue. An issue that crosses reassessments is data related to parent-child interaction. These data were collected to address concerns regarding qualitative aspects of the parent-child system that may have changed. These data were collected on all children during reassessment in Summer 1990. These data have been analyzed across reassessments. A videotape protocol was developed to record parent-child interactions. Examiners were trained in this protocol and recorded interactions as the final part of the reassessment session.

Results and Discussion

This section will present data from all reassessments.

Comparability of Groups on Pretest Measures

Comparability of groups at pretest for each of the reassessment sessions will be presented in this section. Analyses are reported separately for each reassessment because of the change in number of subjects at each reassessment time.

Based on available demographic data (presented earlier in Table 8.1), there was a slight advantage for those subjects whose parents were involved in the Center + PIE group. The Center + PIE group families were better educated, held higher SES occupations, and had higher annual incomes.

Additional information on the comparability of groups is presented in Table 8.15. This table presents data from the core measures at pretest for the Center-Only and Center + PIE groups. On the BDI, there is a slight advantage in favor of the Center-Only group subjects in adaptive and motor domain areas ($p < .10$).

Of the family measures, significant differences were found between the groups only on the FSS. Scores from the Family Support Scale indicate that families in the Center + PIE group had more support. Although the families differed on this measure, their stress ratings (based on the PSI) were not different. Also, resources available to each family (FRS), and family adaptability and cohesion (FACES) by group were comparable. Current knowledge of family functioning makes it difficult to interpret the effect this profile of family functioning results at pretest has on subject or family functioning as a result of intervention. However, because there is no correlation between the pretest scores on the FSS and measures of child functioning at posttest, these initial differences on the FSS are very unlikely to have biased child outcomes. FSS test scores, some demographic measures (e.g., mother

Table 8.15

Comparability of Groups on Pretest Measures for Des Moines Parent Involvement Study

	Reassessment #1								Reassessment #2							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES
• Battelle Developmental[*] Inventory (BDI)																
Personal/Social	108.4	(27.5)	42	106.3	(23.4)	34	.73	-.08	108.2	(29.0)	37	105.8	(23.5)	33	.70	-.08
Adaptive Behavior	72.0	(15.0)	42	65.1	(16.8)	34	.06	-.46	71.2	(15.7)	37	65.6	(16.9)	33	.15	-.36
Motor	102.4	(22.2)	42	92.5	(27.0)	34	.08	-.45	100.0	(22.3)	37	92.4	(27.4)	33	.20	-.34
Communication	52.9	(15.3)	42	50.3	(19.1)	34	.52	-.18	51.6	(15.2)	37	50.1	(19.3)	33	.72	-.10
Cognitive	43.2	(13.8)	42	43.0	(17.8)	34	.94	-.01	42.6	(14.6)	37	42.8	(18.0)	33	.95	.01
TOTAL	378.9	(82.6)	42	357.2	(93.1)	34	.29	-.26	373.7	(86.5)	37	356.7	(94.5)	33	.43	-.20
• Parenting Stress Index (PSI)[♦]																
Child Related (range 0 to 30)	118.9	(20.4)	41	117.4	(18.4)	34	.73	.07	118.8	(20.0)	36	117.9	(18.4)	33	.85	.05
Other Related (range 54 to 270)	131.3	(23.7)	41	131.6	(28.8)	34	.97	-.01	130.2	(22.1)	36	132.8	(28.3)	33	.68	-.12
• Family Adaptability and[♠] Cohesion Evaluation Scales (FACES)																
Adaptation (range 10 to 50)	21.7	(6.7)	41	21.9	(3.7)	34	.89	.03	22.0	(7.0)	36	22.0	(3.7)	33	.97	.00
Cohesion (range 10 to 50)	37.3	(7.0)	41	38.6	(5.2)	34	.38	.19	37.5	(7.2)	36	38.5	(5.2)	33	.50	.14
• Family Resource Scale[♣] (FRS) (range 30 to 150)	118.8	(14.8)	41	116.3	(19.5)	34	.52	-.17	119.7	(14.5)	36	116.3	(19.8)	33	.42	-.23
• Family Support Scale (FSS)[δ] Total Score (range 0 to 4)	1.8	(0.7)	40	2.2	(0.8)	33	.06	.57	1.9	(0.7)	35	2.2	(0.8)	32	.19	.43
• Peabody Picture Vocabulary[Δ] Test - Revised (PPVT)	83.3	(18.1)	40	92.3	(18.3)	34	.04	.50	83.2	(19.1)	35	93.6	(16.9)	33	.02	.54

(continued)

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales, and these are presented.

[♠] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

[♣] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[δ] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[Δ] Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

[°] $ES = \frac{\bar{X}\text{ (Center + PIE)} - \bar{X}\text{ (Center only)}}{\text{SD (Center Only)}}$ The sign of the ES is reversed for the PSI, as lower scores are preferred.

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Table 8.15 (continued)

Comparability of Groups on Pretest Measures for Des Moines Parent Involvement Study

	Reassessment #3								Reassessment #4							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES
• Battelle Developmental Inventory (BDI)[*]																
Personal/Social	108.4	(29.0)	37	106.5	(24.0)	31	.77	-.07	108.4	(29.0)	37	106.3	(23.4)	34	.74	-.07
Adaptive Behavior	71.6	(16.0)	37	65.7	(17.0)	31	.14	-.37	71.6	(16.0)	37	65.1	(16.8)	34	.10	-.41
Motor	100.7	(22.8)	37	92.0	(27.8)	31	.16	-.38	100.7	(22.8)	37	92.5	(27.0)	34	.17	-.36
Communication	52.1	(15.7)	37	50.7	(19.7)	31	.76	-.09	52.1	(15.7)	37	50.1	(19.0)	34	.67	-.13
Cognitive	42.7	(14.6)	37	43.5	(18.3)	31	.84	.05	42.7	(14.6)	37	43.0	(17.8)	34	.94	.02
TOTAL	375.5	(87.5)	37	358.5	(96.3)	31	.45	-.19	375.5	(87.5)	37	357.2	(93.1)	34	.40	-.00
• Parenting Stress Index (PSI)[♦]																
Child Related (range 0 to 30)	118.2	(20.7)	36	118.1	(18.7)	31	.98	.00	118.2	(20.7)	36	117.4	(18.4)	34	.86	.04
Other Related (range 54 to 270)	129.6	(23.0)	36	134.4	(28.0)	31	.44	-.21	129.6	(23.0)	36	131.6	(28.8)	34	.75	-.09
• Family Adaptability and Cohesion Evaluation Scales (FACES)[♣]																
Adaptation (range 10 to 50)	21.9	(7.0)	36	22.0	(3.8)	31	.92	.01	21.9	(7.0)	36	21.9	(3.7)	34	.98	.00
Cohesion (range 10 to 50)	37.5	(7.3)	36	38.2	(5.2)	31	.64	.10	37.5	(7.3)	36	38.6	(5.2)	34	.45	.15
• Family Resource Scale[♠] (FRS) (range 30 to 150)	119.0	(14.1)	36	116.0	(19.5)	31	.47	-.21	119.0	(14.1)	36	116.3	(19.5)	34	.50	-.19
• Family Support Scale (FSS)[δ] Total Score (range 0 to 4)	1.9	(0.7)	35	2.2	(0.8)	30	.11	.43	1.9	(.7)	35	2.2	(.8)	33	.12	.43
• Peabody Picture Vocabulary[&] Test - Revised (PPVT)	82.6	(18.9)	35	93.7	(14.8)	31	.01	.59	82.6	(18.9)	35	92.3	(18.3)	34	.03	.51

(continued)

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales, and these are presented.

[♣] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

[♠] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[δ] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[&] Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

[^] $ES = \frac{\bar{X}\text{ (Center + PIE)} - \bar{X}\text{ (Center only)}}{\text{SD (Center Only)}}$ The sign of the ES is reversed for the PSI, as lower scores are preferred.

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Table 8.15 (continued)

Comparability of Groups on Pretest Measures for Des Moines Parent Involvement Study

	Reassessment #5							
	Center-Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[♦]
. Battelle Developmental Inventory[*] (BDI)								
Personal/Social	108.9	(28.7)	38	110.0	(30.4)	33	.89	.04
Adaptive Behavior	71.3	(15.5)	38	65.6	(16.9)	33	.14	-.37
Motor	100.5	(22.3)	38	92.7	(27.4)	33	.19	-.35
Communication	51.5	(15.2)	38	50.4	(19.4)	33	.79	-.07
Cognitive	42.5	(14.3)	38	43.2	(18.0)	33	.86	.05
TOTAL	374.7	(85.5)	38	358.8	(94.1)	33	.46	-.19
. Parenting Stress Index[♦]								
Child Related (range 0 to 30)	118.6	(20.5)	37	117.1	(18.7)	33	.75	.07
Other Related (range 54 to 270)	130.4	(23.1)	37	131.7	(29.2)	33	.83	-.06
. Family Adaptability and Cohesion[♣] Evaluation Scales (FACES)								
Adaptation (range 10 to 50)	22.3	(6.8)	37	21.9	(3.7)	33	.78	-.06
Cohesion (range 10 to 50)	37.9	(7.0)	37	38.8	(5.2)	33	.54	.13
. Family Resource Scale (FRS)[♠] (range 30 to 150)	118.8	(13.8)	37	115.9	(19.6)	33	.48	-.21
. Family Support Scale (FSS)[▾] Total Score (range 0 to 4)	1.9	(.6)	36	2.2	(.8)	32	.13	.50
. Peabody Picture Vocabulary[▲] Test--Revised (PPVT)	83.5	(18.9)	36	92.4	(18.6)	33	.05	.47

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales, and these are presented.

[♣] Scores for each subscale of the FACES are based on linear scoring where high scores are preferred.

[♠] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[▾] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[▲] Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

[^] $$ES = \frac{\bar{x}\ (\text{Center + PIE}) - \bar{x}\ (\text{Center only})}{\text{SD (Center Only)}}$$ Sign of the ES is reversed for the PSI, as lower scores are preferred

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education), and other family measures do correlate. Therefore, the FSS was considered as a potential covariate for later analyses.

Also included on Table 8.13 are scores from mother's performance on the Peabody Picture Vocabulary Test. This result is not an outcome variable, even though obtained at posttest. These data are related to the comparability of groups. A significant difference was found between mother's standard scores on this test, with mothers in the Center + PIE group demonstrating higher scores. Standard scores on this test are highly correlated with IQ scores. Mother's IQ has been hypothesized to be related to intervention success. PPVT scores were considered as a covariate for all later analyses.

Overall, these results suggest that any group advantages at pretest favored the Center + PIE group on demographic and family functioning variables. However, child functioning variables favor the Center-Only group.

The pattern of results found for comparability of groups at Reassessment #1 is essentially the same for Reassessment #'s 2, 3, 4, an 5 (see Tables 8.1 and 8.15). Although there are minor changes from one to another, the general pattern is one of comparability between the groups. What few differences do exist primarily favor the Center + PIE group on demographic variables and on maternal IQ. As noted earlier, variables where differences were discovered were considered in selecting covariates for the analysis of differences between groups at reassessments. Thus, any bias related to those differences was likely to be adjusted as a result of using analysis of covariance.

Effects of Alternative Forms of Intervention

The following section will analyze the effects of the alternative forms of intervention on child and family functioning, and examine some site specific analyses.

Selection of covariates. The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. (Analyses other than analyses of covariance are described as such in the text and/or table.) Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance, and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis. All pretests and demographic variables and variables that could impact on treatment were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. According to Hopkins (1973) and Cohen (1977), in those cases where a covariate or set of covariates can be found which correlates with the dependent variable (which was almost always the case in these analyses), analysis of covariance can substantially increase power. In this study, with alpha set at $p \leq .10$, statistical power for finding a moderately sized difference (defined by Cohen as differences of a half a standard deviation) at Reassessment #1 was approximately above 99% for child outcome measures and approximately 91% for the majority of family outcome variables. Power for the PAAT, CES-D, and Child Improvement Questionnaire was approximately 70%. A small decrement in statistical power occurs at each successive reassessment as correlations between pretest and outcome variables slightly decrease.

Measures of Child Functioning

Results of reassessment data analysis on child functioning for Reassessment #1, #2, and #3 are presented in Table 8.16, and for Reassessment #4 and #5 in Table 8.17.

Reassessment #1. After one year of intervention, results from the BDI show statistically significant differences ($p < .10$) on the adaptive behavior and communication domains in favor of the Center + PIE group. Statistically significant differences were not found on other domains, nor on the Total BDI score. Statistically significant differences were not found on the Joseph Preschool and Primary Self-Concept Inventory (JSI) nor on the Stanford-Binet. These results suggest that the addition of this type of parent involvement program had some impact on measures of child development, but the impact was not consistent across the various domains measured. All but one of the effect sizes were positive, but it is unclear why there would be statistically significant differences for adaptive behavior and communication, but not for the other domains of the Battelle nor for the Stanford-Binet.

Reassessment #2. Results from Reassessment #2 are also presented in Table 8.16. Information on the Stanford-Binet is not included for this analysis since it was not administered after the 1986-87 academic year. As mentioned earlier, Reassessment #2 analyses include subjects who "graduated" to school-age programs as well as those who received two consecutive years of intervention. No group differences were found on any of the BDI domains or total score. Results from the JSI also indicate no group differences (however, note the difference in the JSI sample between Reassessments #1 and #2). Data indicate that any positive effects of the parent involvement were not maintained over time or may have been the result of sampling fluctuation. These data may have been effected by the implementation of the PIE II curriculum for some parents. These effects will be examined in analyses presented later in this report.

Reassessment #3. Table 8.16 also includes child measure results from Reassessment #3. No group differences were found on the BDI or JSI.

Reassessment #4. Results from Reassessment #4 are presented in Table 8.17. The child measures used at this posttest represent an entirely different instrument battery. However, the results are consistent with the findings of Reassessments #2 and #3. No statistically significant differences were found between groups on the Woodcock-Johnson Tests of Achievement, on the Scales of Independent Behavior, nor on the JSI.

Also included on Table 8.17 are the teacher completed SPECS. Four of the six scales assessed by this measure show a statistically significant difference between the groups (communication, self-regulation, cognition, and self-control). These results indicated that teachers rated children in the Center + PIE group as having more appropriate skills than the Center-only group in the communication, cognition, self-regulation, and self-social areas.

Reassessment #5. Results from Reassessment #5 are also presented in Table 8.17. In addition to the Woodcock-Johnson and SIB, data are presented from the Harter Self-Concept Scale (which replaced the JSI), and from parent and teacher ratings on the Social Skills Rating Scale (which replaced the SPECS). The results of these analyses are consistent with findings from earlier reassessments. No statistically significant differences were found on the majority of measures. A statistically significant difference was found on the Physical Competency Scale of the Harter Perceived Self-Concept Inventory indicating that children in the Center + PIE group perceived themselves as more physically competent than the children in the Center-only group. Also, a statistically significant difference favoring the Center + PIE group children was found on the problem behaviors scale of the SSRS as rated by the teacher. However, the sample on which this result is based is not complete, and will

Table 8.16

Reassessment Measures of Child Functioning for Reassessment #1, #2, and #3 for Des Moines Parent Involvement Study

		Center Only				Center + PIE						
Variable	Covariates♦	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	P Value	ES^
Reassessment #1												
Age in months at posttest	---	59.9	(11.7)		42	59.3	(11.6)		34	.05	.82	-.05
Battelle developmental Inventory* (BDI)												
Personal/Social	20,1	118.2	(24.6)	115.3	42	116.1	(25.9)	118.9	34	.77	.38	.15
Adaptive Behavior	1,6,14	75.0	(15.0)	71.7	42	72.9	(20.9)	76.8	34	4.64	.04	.34
Motor	1	112.4	(23.4)	108.0	42	102.4	(28.6)	106.9	34	.09	.76	-.05
Communication	1	58.4	(16.0)	55.3	42	57.9	(21.1)	61.0	34	4.11	.05	.36
Cognitive	1	51.9	(16.4)	49.1	42	49.0	(17.9)	51.8	34	.95	.33	.16
TOTAL	1	415.9	(82.9)	398.5	42	398.4	(103.9)	415.7	34	2.37	.13	.21
Stanford-Binet+	1	75.6	(18.8)	73.3	28	72.1	(15.9)	74.4	19	.06	.81	.06
Joseph Preschool Primary* Self-Concept Inventory	2	19.5	(5.8)	19.2	11	20.9	(4.1)	21.2	7	1.57	.23	.34
Reassessment #2												
Age in months at posttest	---	70.9	(12.2)		37	71.6	(12.5)		33	.07	.80	.06
Battelle developmental Inventory* (BDI)												
Personal/Social	3	132.8	(25.4)	130.7	37	128.5	(32.6)	130.6	33	.00	.99	-.00
Adaptive Behavior	1,14	89.3	(18.0)	86.0	37	84.5	(20.1)	87.9	33	.59	.45	.11
Motor	2	120.9	(24.8)	116.8	37	111.6	(32.9)	115.7	33	.15	.70	-.04
Communication	16	68.0	(18.9)	67.2	37	66.6	(23.2)	67.3	33	.00	.96	.01
Cognitive	17,12	65.7	(23.0)	64.5	37	64.9	(25.4)	66.1	33	.31	.58	.07
TOTAL	3,12	476.7	(97.7)	463.8	37	456.1	(124.5)	469.0	33	.18	.68	.05
Joseph Preschool Primary* Self-Concept Inventory	3	22.2	(6.4)	22.1	32	23.7	(4.3)	23.8	29	1.87	.18	.27
Reassessment #3												
Age in months at posttest	---	83.8	(12.1)		37	83.7	(11.7)		31	.00	.98	.01
Battelle developmental Inventory* (BDI)												
Personal/Social	3,25	146.4	(17.2)	144.6	37	143.8	(27.7)	145.6	31	.07	.79	.06
Adaptive Behavior	1	97.5	(15.5)	94.9	37	94.3	(21.3)	97.0	31	.55	.46	.14
Motor	2,25	130.4	(23.1)	125.6	37	121.7	(33.1)	126.4	31	.08	.78	.03
Communication	16	77.7	(20.9)	77.0	37	76.1	(25.2)	76.8	31	.00	.94	-.01
Cognitive	17	75.0	(22.8)	75.5	37	73.3	(25.8)	72.8	31	.67	.42	-.12
TOTAL	3,25	526.9	(88.9)	517.4	37	509.1	(125.0)	518.5	31	.01	.93	.01
Joseph Preschool Primary* Self-Concept Inventory	---	23.3	(4.4)	23.3	31	25.0	(3.5)	25.0	24	2.35	.13	.39

* Statistical analysis for BDI and JSI were conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center Only Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

♦ Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 7 = FACES Total; 8 = FACES Discrepancy; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child

+ Statistical analysis for the Stanford-Binet were conducted using IQ scores.

not be available until January 1993. These findings, as yet, do not suggest an impact of intervention, but these areas can be examined for consistency across time at future reassessments.

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Table 8.17

Reassessment #4 and #5 Measures of Child Functioning for the Des Moines Parent Involvement Study

		Center Only				Center + PIE						
Variable	Covariates♦	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	P Value	ES^
REASSESSMENT #4												
Age in months at posttest	---	96.3	(12.7)	---	37	97.0	(11.8)	---	34	.06	.80	.06
Woodcock-Johnson Test of Achiev.												
Broad Knowledge	3	461.7	(19.4)	459.9	37	458.5	(27.4)	460.3	34	.01	.91	.02
Skills	17	422.3	(38.4)	422.7	37	416.7	(50.6)	416.4	34	.82	.34	-.16
Scales of Independent Beh.												
Motor Skills	2	462.8	(22.3)	458.4	37	455.0	(40.7)	459.4	34	.04	.84	.04
Social/Communication	3	465.0	(14.9)	463.6	37	463.9	(20.8)	465.3	34	.40	.53	.11
Personal Living	2	471.4	(17.3)	468.5	37	466.9	(25.8)	469.7	34	.13	.72	.07
Community Living	3	443.4	(24.0)	441.4	37	443.6	(26.8)	445.6	34	1.18	.28	.18
Broad Independence	2	461.0	(17.3)	457.9	37	457.4	(27.1)	460.5	34	.71	.40	.15
Joseph Total	26	24.8	(5.0)	24.8	30	25.0	(3.6)	25.1	27	.06	.82	.06
Teacher SPECS+												
Communication	1	6.5	(1.6)	6.4	28	7.1	(1.5)	7.2	31	4.02	.05	.50
Sensory Motor	1	16.2	(2.8)	16.0	28	16.9	(2.8)	17.0	31	2.17	.15	.36
Physical	1	12.4	(1.8)	12.3	28	13.0	(2.0)	13.1	30	2.20	.14	.44
Self Regulation	1	13.9	(3.2)	13.8	28	15.6	(3.0)	15.8	31	5.92	.02	.63
Cognition	1	5.9	(2.2)	5.8	28	7.0	(1.7)	7.1	31	7.34	.009	.59
Self-Social	1	13.4	(3.3)	13.1	28	15.2	(3.0)	15.4	31	9.88	.003	.70
REASSESSMENT #5												
Age in months at reassessment		108.6	(11.6)		38	109.1	(12.1)		33	.04	.85	.04
Woodcock-Johnson Test of Achiev.												
Broad Knowledge	3	469.0	(19.3)	467.6	38	465.5	(25.8)	467.0	33	.03	.87	-.03
Skills	3	435.6	(40.6)	432.8	38	431.2	(48.9)	434.0	33	.03	.87	.03
Scales of Independent Beh.												
Motor Skills	2	466.9	(22.3)	463.1	38	456.1	(38.1)	459.9	33	.05	.48	-.14
Social/Communication	3	468.7	(13.6)	467.8	38	467.5	(17.3)	468.5	33	.07	.80	.05
Personal Living	2	477.4	(15.0)	475.0	38	470.0	(24.9)	472.4	33	.64	.43	-.17
Community Living	3	454.2	(25.8)	452.7	38	451.3	(24.6)	452.8	33	.00	.97	.00
Broad Independence	2	466.9	(16.8)	464.4	38	461.3	(24.6)	463.8	33	.04	.84	-.04
Harter Perceived Self-Concept Inventory												
Cognitive Competency	13	20.8	(2.3)	20.6	34	20.9	(2.1)	21.1	28	.59	.45	.22
Peer Acceptance	1	16.9	(4.2)	16.8	37	18.2	(5.1)	18.3	28	1.60	.21	.36
Physical Competency	2	19.24	(3.4)	19.2	37	20.5	(2.9)	20.6	28	3.8	.06	.41
Maternal Acceptance	19	16.7	(4.1)	16.6	36	17.6	(4.0)	17.7	28	1.3	.27	.27
Parent Social Skills Rating Scale												
Skill Total	26	88.0	(15.3)	88.3	36	89.4	(16.0)	89.1	31	.05	.82	.05
Problem Behaviors	1	118.2	(62.8)	117.0	38	101.1	(18.2)	102.3	31	1.57	.22	.23
Teacher Social Skills Rating Scale												
Skills Total	1,12	85.8	(13.1)	85.0	16	88.3	(8.8)	89.1	17	1.35	.26	.31
Problem Behaviors	10	117.8	(9.5)	118.0	16	110.5	(15.1)	110.2	17	3.46	.07	.86
Academic Competence	2,10	87.6	(14.3)	87.5	16	87.9	(8.6)	88.0	17	.02	.88	.03

* Statistical analysis were conducted using weighted raw scores for the Woodcock-Johnson and for the Scales of Independent Behavior. Standard scores were used for analysis on both Social Skill Rating Scales. Raw scores were used for analysis on all other measures.

^ $$ES = \frac{\text{Adj.}\bar{X}\ (\text{Center + PIE}) - \text{Adj.}\bar{X}\ (\text{Center-Only})}{SD\ (\text{Center-Only})}$$

+ The SPECS were completed by each child's teacher. The raw scores possible for each domain are: Communication, 2 to 10; sensory motor, 4 to 20; Physical, 3 to 15; self-regulation, 4 to 20; Cognition, 2 to 10; and self/social, 4 to 20. Higher scores are preferred.

♦ Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 7 = FACES Total; 8 = FACES Discrepancy; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child

Measures of Family Functioning

Table 8.18 presents data on parent and family functioning for Reassessments #1, #2, #3, #4, and #5.

Table 8.18

Reassessment Measures of Family Functioning for Des Moines Study

		Reassessment #1														Reassessment #2													
		Center Only					Center + PIE								Center Only					Center + PIE								
Variable	Covariates*	X̄	(SD)	Adj.X̄	%ile	n	X̄	(SD)	Adj.X̄	%ile	n	ANCOVA F	P Value	ES^	X̄	(SD)	Adj.X̄	%ile	n	X̄	(SD)	Adj.X̄	%ile	n	ANCOVA F	P Value	ES^
Parent Stress Index (PSI)#																												
Child Related	5	118.2	(21.7)	117.3	86	41	112.8	(16.5)	113.7	80	34	1.32	.25	.17	119.0	(20.7)	118.8	88	35	118.5	(17.0)	118.6	88	32	.00	.96	.01
Other Related	6	134.5	(24.1)	134.2	72	41	129.6	(26.2)	129.9	66	34	1.85	.18	.18	129.2	(20.1)	130.4	66	35	133.2	(28.0)	131.9	70	32	.14	.71	-.07
TOTAL	4	252.7	(39.8)	251.4	81	41	242.4	(38.1)	243.6	75	34	2.32	.13	.20	248.2	(35.5)	249.2	79	35	251.6	(39.6)	250.6	81	32	.05	.82	-.04
Family Support Scale (FSS)♦♦																												
TOTAL	9,**10**	1.5	(.8)	1.6		39	2.1	(.6)	2.0		34	8.34	.01	.50	1.7	(.8)	1.8		23	2.1	(.9)	2.0		24	.60	.44	.25
Family Adaptation* Cohesion Eval. (FACES)																												
Adaptation	19	21.4	(6.7)	21.5		40	20.8	(4.9)	20.7		33	.45	.51	-.09	21.2	(5.4)	21.2		34	20.3	(5.2)	20.3		32	.56	.46	-.17
Cohesion	6,20	38.0	(7.0)	38.4		40	38.1	(6.0)	37.7		33	.30	.59	.01	36.6	(7.2)	36.9		34	36.9	(6.9)	36.6		32	.04	.85	.04
Child Improvement## (Locus of Control)																												
Professional	**18**	18.7	(2.8)	18.9		41	19.9	(4.3)	19.6		34	.74	.39	.25	19.9	(4.5)	19.9		36	19.3	(3.8)	19.3		32	.46	.50	-.13
Divine Intervention	**14,12**,23	12.5	(3.3)	12.1		41	11.4	(3.5)	11.9		34	.09	.76	-.06	11.5	(3.4)	11.2		36	11.6	(3.6)	11.8		32	.38	.54	.18
Parent		23.4	(2.5)	23.4		41	23.9	(3.1)	23.9		34	.66	.42	.20	23.8	(2.8)	23.8		36	23.9	(3.2)	23.9		32	.02	.89	.04
Child	**5,12**,13	21.3	(3.0)	21.0		41	19.8	(4.2)	2C.1		34	1.20	.28	-.30	21.9	(4.0)	21.5		36	19.4	(3.8)	19.8		32	3.76	.06	-.43
Chance	13,12	11.6	(3.7)	11.2		41	9.3	(3.1)	9.7		34	3.75	.06	-.41	12.7	(4.6)	12.0		36	9.7	(3.2)	10.4		32	3.76	.06	-.35
CES-D Depression#	6	31.6	(9.0)	31.5		41	28.4	(8.6)	28.4		34	2.88	.09	.34	29.1	(6.7)	29.4		36	33.8	(12.0)	33.5		33	4.37	.04	-.61
Parent as a Teacher♦ Scale (PAAT)																												
Creativity	5														26.7	(1.6)	26.7		34	27.0	(2.7)	27.0		32	.30	.58	.19
Frustration	3,4														27.0	(2.1)	27.1		34	26.7	(3.1)	26.6		32	.63	.43	-.24
Control															25.7	(2.7)	25.7		34	27.0	(2.6)	27.0		32	3.76	.06	.48
Play	4														28.9	(2.5)	28.8		34	29.3	(2.9)	29.3		32	.65	.42	.20
Teaching/Learning	5														28.7	(2.7)	28.7		34	29.7	(3.0)	29.7		32	2.59	.11	.37
TOTAL	4														137.0	(8.3)	137.8		34	139.7	(11.5)	138.9		32	.25	.62	.33

(continued)

^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center Only Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI and CES-D, the numerator for the ES is reversed, as lower scores are preferred.

Statistical analysis for the PSI and CES-D were based on raw scores where low raw scores are most desirable.

* Scores for each subscale of the FACES are derived from linier scoring where higher scores are preferred.

♦ Statistical analyses for the FRS and PAAT were based on raw scores where higher scores are preferred.

♦♦ Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

* Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child; 31 = FSS sources of support; 32 = father education. Covariate numbers in standard type were used for both Reassessment #1 and #2, **bold** numbers were used for Reassessment #1 only, underlined numbers were used for Reassessment #2 only.

## On the Child Improvement Questionnaire, ESs are used only to indicate direction of result. See text for interpretation of findings. Statistical analyses are based on raw scores.

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Table 8.18 (continued)

Reassessment Measures of Family Functioning for Des Moines Study

		Reassessment #3														Reassessment #4													
		Center Only					Center + PIE								Center Only					Center + PIE							
Variable	Covariates°	X̄	(SD)	Adj.X̄	%ile	n	X̄	(SD)	Adj.X̄	%ile	n	ANCOVA F	P Value	ES^	X̄	(SD)	Adj.X̄	%ile	n	X̄	(SD)	Adj.X̄	%ile	n	ANCOVA F	P Value	ES^
Parent Stress Index (PSI)#																											
Child Related	5,31	116.0	(18.5)	116.0	80	37	112.5	(22.4)	112.6	80	31	.63	.43	.02	116.0	(20.6)	114.7	80	36	110.4	(19.6)	111.6	77	32	.63	.43	-.27
Other Related	3,13,6,31	129.8	(21.0)	130.7	68	37	130.3	(27.1)	129.4	65	31	.11	.74	.06	127.7	(27.5)	127.6	61	36	126.1	(24.9)	126.1	60	32	.12	.74	-.06
TOTAL	4,31	245.8	(34.4)	247.3	78	37	242.8	(45.2)	241.3	72	31	.64	.43	.17	243.7	(46.0)	242.2	72	36	236.4	(39.2)	237.9	69	32	.32	.57	-.16
Family Support Scale (FSS)♦♦																											
TOTAL	9,20														1.9	(.8)	2.0		32	1.8	(.8)	1.8		30	1.60	.21	-.25
Family Adaptation* Cohesion Eval. (FACES)																											
Adaptation	19	21.8	(5.7)	21.8		36	21.6	(5.1)	21.6		31	.04	.85	-.04	21.1	(5.3)	21.1		35	22.1	(4.4)	22.2		32	.90	.35	.21
Cohesion	20,6,4,10	37.5	(6.7)	37.6		36	38.6	(5.2)	38.5		31	.65	.42	.16	37.5	(6.9)	37.8		35	38.7	(6.4)	38.5		32	.29	.59	.10
Child Improvement## (Locus of Control)																											
Professional	17	18.3	(4.2)	18.3		37	18.8	(4.2)	18.8		31	.24	.63	.12	19.4	(4.2)	19.4		36	18.3	(4.1)	18.3		32	1.21	.28	-.26
Divine Intervention	14,27	12.3	(3.6)	12.4		37	11.9	(3.6)	11.8		31	.55	.46	-.17	12.0	(3.2)	11.7		36	11.4	(3.7)	11.7		32	.01	.94	-.19
Parent	25,28,31	22.3	(3.9)	22.4		37	24.0	(2.8)	23.9		31	3.52	.07	.38	23.3	(3.9)	23.2		36	23.3	(4.2)	23.4		32	.06	.81	.00
Child	18,12	21.4	(3.0)	20.9		37	21.0	(3.9)	21.5		31	.42	.52	.20	22.2	(2.6)	21.6		36	19.9	(5.7)	20.5		32	1.12	.29	-.88
Chance	13,20,19,23,14,	12.1	(4.1)	11.6		37	9.5	(3.0)	10.0		31	4.47	.04	-.39	11.6	(3.7)	11.1		36	10.2	(4.2)	10.7		32	.22	.64	-.38
CES-D Depression#	6,12	31.3	(9.4)	30.8		37	30.3	(8.4)	30.8		30	.00	.99	.00													
Parent as a Teacher♦ Scale (PAAT)																											
Creativity	6,9,19,5	26.8	(1.8)	26.6		33	26.6	(2.0)	26.8		30	.18	.67	.11	26.3	(2.5)	26.4		36	26.3	(2.0)	26.2		32	.16	.69	.00
Frustration	6,4,10	27.0	(1.9)	27.0		33	27.2	(2.6)	27.3		30	.36	.55	.16	27.7	(2.7)	27.7		36	26.7	(1.5)	26.7		32	4.07	.05	-.37
Control	9,7,1,13,20	25.3	(2.8)	25.8		33	27.5	(2.5)	27.0		30	3.36	.07	.43	25.2	(2.4)	25.5		36	26.6	(2.2)	26.2		32	1.68	.20	.58
Play	6,1,4,12	29.2	(2.6)	29.1		33	29.8	(2.6)	29.9		30	1.75	.19	.31	29.0	(2.4)	29.2		36	28.9	(2.0)	28.7		32	1.06	.31	-.04
Teaching/Learning	6,9,12	28.9	(2.8)	29.1		33	29.6	(2.6)	29.5		30	.29	.59	.14	29.1	(3.6)	29.5		36	29.2	(2.8)	28.8		32	.90	.35	.03
TOTAL	9,13	137.2	(8.4)	137.2		33	140.8	(9.0)	140.8		30	2.72	.10	.43	137.3	(10.1)	138.3		36	137.6	(7.1)	136.6		32	.79	.38	.03

^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center-Only Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI and CES-D, the numerator for the ES is reversed, as lower scores are preferred.

# Statistical analysis for the PSI and CES-D were based on raw scores where low raw scores are most desirable.

* Scores for each subscale of the FACES are derived from linier scoring where higher scores are preferred.

♦ Statistical analyses for the FRS and PAAT were based on raw scores where higher scores are preferred.

♦♦ Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

° Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child; 31 = FSS sources of support; 32 = Father Education. Covariate numbers in standard type were used for both Reassessment #1 and #2, **bold** numbers were used for Reassessment #3 only, underlined numbers were used for Reassessment #4 only.

## On the Child Improvement Questionnaire, ESs are used only to indicate direction of result. See text for interpretation of findings. Statistical analyses are based on raw scores.

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Table 8.18 (continued)

Posttest Measures of Family Functioning for Des Moines Study

		Reassessment #5										
		Center Only				Center + PIE						
Variables	Covariates°	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	p Value	ES^
Family Support Scale (FSS) TOTAL	24	1.7	(.69)	1.7	33	1.8	(.82)	1.9	30	.63	.43	.29
Child Improvement## **(Locus of Control)**												
Professional		18.4	(4.1)	18.4	35	18.7	(5.0)	18.7	30	.07	.79	.07
Divine Intervention	13	12.3	(3.0)	12.0	32	12.0	(3.3)	12.2	30	.08	.78	.07
Parent	1	23.5	(2.5)	23.6	35	24.3	(3.6)	24.2	30	.56	.46	.24
Child	13	21.2	(3.1)	20.8	32	21.1	(4.2)	21.4	30	.43	.52	.19
Chance	12	11.1	(4.0)	10.4	33	10.0	(4.2)	10.7	30	.16	.69	.08
Comprehensive Evaluation of Family Functioning (CEFF)	4	76.7	(21.0)	76.9	35	77.1	(21.9)	76.9	30	.00	.99	.00
Parent Self-Awareness Scale												
Total	6	42.8	(6.5)	42.6	35	43.8	(6.9)	44.0	31	.96	.33	.22

^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center-Only Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI and CES-D, the numerator for the ES is reversed, as lower scores are preferred.

Statistical analysis for the PSI and CES-D were based on raw scores where low raw scores are most desirable.

* Scores for each subscale of the FACES are derived from linier scoring where higher scores are preferred.

♦ Statistical analyses for the FRS and PAAT were based on raw scores where higher scores are preferred.

♦♦ Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

° Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child; 31 = FSS sources of support; 32 = Father Education.

On the Child Improvement Questionnaire, ESs are used only to indicate direction of result. See text for interpretation of findings. Statistical analyses are based on raw scores.

Reassessment #1. Families in the Center + PIE group were found to have more sources of support available to them based on scores from the Family Support Scale. It is possible that the support component of the PIE influenced perceived social support. A significant difference was also found on the CES-D. Mothers in the Center + PIE group reported less depression symptomatology. This finding could be associated with increased support perceived by these mothers.

A difference was found on one subscale of the Child Improvement Questionnaire (CIQ) which assesses locus of control perceptions. The CIQ was designed to measure parental beliefs concerning control over the improvement of children who are physically, emotionally, or developmentally impaired. A significant difference was found on the chance subscale. The subscale assesses parental beliefs that their child's improvement is largely a matter of fate or of factors beyond their control. Parents of children in the Center + PIE group were significantly less likely to

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believe their child's progress was due to fate. A change away from believing fate is controlling child improvement is a change that may be associated with PIE. One goal of the PIE was to help the parents improve their intervention skills to increase the perceptions of themselves as a factor in their child's improvement. Therefore, change in the parent subscale of the CIQ was expected, but did not occur. This failure to find a difference decreases confidence in the parent empowerment aspects of the PIE as assessed by this measure.

In addition to the analyses reported in Table 8.18, the subscales of the PSI were analyzed. Some caution is suggested when making interpretations based on these results, as the PSI authors recommend against using the subscales for interpretive purposes. These subscales were analyzed here for exploratory purposes. On the subscales, a significant difference was found in parents' stress regarding their sense of competence, with those parents in the Center + PIE group viewing themselves as more competent (less stressed). No differences were found on the 12 other subscales that compare the PSI.

The results from measures of family functioning should be interpreted conservatively. The majority of comparisons (i.e., PSI, FACES) show no differences between groups. The results of the FSS may be a treatment verification variable indicating that support was indeed provided as part of the PIE. It is also possible that in conducting as many analyses as were done here that findings of significance may occur, even when groups are comparable. The overall effects of adding this type of parent involvement group to an existing center-based early intervention program are quite small, if they exist at all. There is some evidence that mothers in the parent involvement group are less depressed, that they are less likely to attribute their child's condition to chance, and that they report more sources of support. However, on a wide range of other measures of family functioning, there were no statistically significant differences.

Reassessment #2. Statistically significant differences were found on the child and chance subscales of the Child Improvement Questionnaire. The finding on the chance subscale repeats that found at Reassessment #1. Center + PIE families were significantly less likely to believe their child's progress was due to fate. Center + PIE parents also attributed less of their child's progress to their child (i.e., within child attributions). Both of these differences could be attributed to the parent involvement component.

A significant difference was again found on the CES-D, but this time favoring the Center-Only group. This finding is the reverse of what occurred at Reassessment #1. A significant difference was found on the PAAT control subscale. This difference suggested that Center + PIE parents were exerting more control over their children in teaching situations. Different hypothetical viewpoints exist as to the advantages or disadvantages of parental directiveness (cf., Blasco, Hrncir, Blasco, 1990; Mahoney & Powell, 1988).

Overall, the results from family measures suggest that the only clear place that parent involvement may have affected families is on their attributions of progress in their child and on their directiveness in teaching situations. Other impacts seem negligible. Once again, it should be noted that some children and parents continued in intervention at this posttest, while others did not. This effect of this will be examined in later analyses.

Reassessment #3. Results from this posttest are presented in Table 8.18. Differences between the groups occurred on the parent and chance scales of the CIQ, and on the control scale and total score of the PAAT. The results from the CIQ suggest that parents in the Center + PIE group view themselves as being an agent of change in their child's progress. This is a desired outcome of the parent involvement. Also, the finding that parents in the Center + PIE group are less likely to attribute their child's progress to chance is consistent with earlier posttests. The result from the PAAT suggest that the parents of children in the

Center + PIE group exert more control over their child during teaching interactions (which replicates Reassessment #2 findings) and engage, overall, in more positive teaching interactions with their child. This result is also positive toward the parent involvement component. Although there appear to be some small and limited benefits for this type of parent involvement program when added to a center-based program, the overall impact of the parent involvement component on a broad array of family functioning measures is negligible.

Reassessment #4. Table 8.18 presents results from this reassessment. Only one difference between groups was found at this testing. Parents of children in the Center-Only group reported more frustration in learning situations on the PAAT. Reassessment #4 results, overall, show no group differences. Even the positive attributions of child progress of the Center + PIE group have faded at this posttest.

If you examine the results of the CIQ across reassessments, there is a clear trend toward statistically significant findings on subscales that favor the Center + PIE group in a manner consistent with expected intervention impacts. However, the specific subscales found to be statistically significant fluctuate. These results suggest a positive impact of intervention on parent attributions of child success in a direction over which the parents have greater control. The fluctuation in findings does suggest that these results need to be examined in future studies, perhaps using other instruments.

Reassessment #5. The reader will note some changes in family measures at Reassessment #5. These changes have been made to broaden the understanding of possible impacts on families, and the measures are described in Table 8.14. No statistically significant differences were found on the new scales nor on other measures. For the CEFF, all subscales were examined and statistically significant differences were not found. The failure to find any statistically significant difference on the CIQ may indicate that impacts that occurred to attributions as a result of intervention are dissipating.

Parent/Child Interaction

It was possible that the alternative forms of intervention may have affected parent/child interactions in a way that was not detected by the family measures. Preliminary results from other EIRI studies provided evidence which suggested parent/child interactions may have been impacted by the parent involvement component. To determine if the alternative interventions had an effect on parent/child interactions, these interactions were assessed during the reassessment that occurred in 1990.

All children who were posttested in 1990, and had parents who consented, were videotaped in a structured parent/child interaction situation. These children included subjects in Cohort #1 and #2. Therefore, some subjects were being tested for Reassessment #3 and others for Reassessment #4. The parent (typically mothers) and child were videotaped using a structured videotape protocol. Videotapes were scored using the Parental Behavior Rating Scale (Mahoney, Finger, & Powell, 1985) by observers trained and supervised by the scale developer, Gerald Mahoney.

The Parental Behavior Rating Scale assesses 12 variables that relate to parent/child interaction: expressiveness, enjoyment, warmth, sensitivity to child's interest, responsivity, achievement orientation, inventiveness, verbal praise, effectiveness, pace, acceptance, and directiveness. (Definitions of these variables can be obtained by writing EIRI or Dr. Mahoney.) Each factor is scored from 1 to 5, with 5 indicating greater amounts of the factor being measured. These 12 variables were divided into 3 major factors based on a maximum likelihood factor analysis with oblique rotation of these variables for 237 observations of parent-child interaction collected by the longitudinal studies. The three factors that were identified together accounted for 59.6% of the variance. Factor 1, Affective Relationship with Child, included expressiveness toward child, warmth, enjoyment of interacting with child, acceptance of child's behaviors, and inventiveness in play. For Factor 2, Responsivity to Child, sensitivity to child's interests, responsivity, inventiveness in play, and effectiveness of parent to engage child in play interaction were summed and directiveness (frequency and intensity of directives) was subtracted. Factor 3, Performance Orientation, included achievement orientation, verbal praise, pace of parent's behaviors, and intensity and frequency of directives. The reliability coefficients of the three factors were .88, .83, and .61, respectively.

An analysis of covariance was conducted on scores from each of the 12 variables and from the 3 factors. Covariates were selected in the manner described earlier. No significant differences were found between groups on individual factors or major factors. The results for the three factors are presented in Table 8.19. These results indicate that aspects of parent/child interaction as assessed by this observational instrument were not impacted by the parent involvement component at this time. It is not known if parent/child interaction would have been impacted immediately following intervention.

Table 8.19

Measures of Parent/Child Interaction for Des Moines Parent Involvement Study

		Center-Only				Center + PIE						
Variable	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES^
Chronological age at taping (months)	--	91.3	(13.0)		33	92.3	(12.0)		30	.22	.64	.08
Responsivity	1	14.3	(2.7)	14.3	33	14.9	(3.0)	14.9	30	.65	.42	.22
Performance Orientation	1	8.2	(2.7)	8.1	33	8.8	(2.8)	8.8	30	.97	.33	.26
Affective Relationship	1	12.8	(3.1)	12.8	33	13.8	(2.8)	13.8	30	1.97	.17	.32

* 1 = CA at taping

^ $$ES = \frac{\text{Adj.x (Center + PIE) - Adj.x (Center-Only)}}{\text{SD (Center-Only)}}$$

Classroom Follow-Up

It is possible that the effects of this type of parent involvement component may not become apparent until the child is in elementary school. To assess this, teachers of children in the study were initially contacted at the end of the 1989/90 school year for information and have been contacted regularly since that time.

Teacher information will be reported from the analysis of all data collected in 1989/90 (cross-reassessments) and from those data collected from teachers following Reassessment #4. All teacher data from Reassessment #5 has not yet been obtained, but will be available in January 1993. Teacher data are collected in the fall following each reassessment, and asks teachers to provide information based on the performance of the child during the past academic year. This system has been found acceptable to the Des Moines Public School District. Teachers are requested to complete protocols on their own time and are paid for their participation.

Teachers were asked to complete a questionnaire on the child and the child's classroom placement. Information was requested on the teacher's perception of the child's parents, as well as some teacher specific and general classroom information. Teachers also completed other protocols (i.e., SPECS, SSRS) at this time.

Cross-reassessments school analysis. For this analysis, teachers were not informed of the specific purpose of the research or given any information that the child had been in an early intervention program for children with disabilities. Teachers who received these questionnaires had been identified by the parent as the child's teacher when permission to contact teachers was obtained. Fifty-five teachers, representing 71 subjects, were contacted; 48 returned information, representing 60 subjects. Of these 60 subjects, 43 were Cohort #1 subjects and 17 were Cohort #2 subjects.

Information obtained from these teachers is presented in Tables 8.20 and 8.21. Table 8.20 presents descriptive information, by number of children, on grade placement, type of mainstreaming that occurs, and primary classroom placement. The majority of children are in self-contained, special education placements. The grade these children are in varies from preschool to second grade. A large group of children (46%) are in mixed grade self-contained classrooms. Of those children who are not in a typical placement, a variety of mainstreaming options were found.

Table 8.20

Descriptive Information on School Placement Cross-Reassessments #3 and #4 by Numbers of Subjects for Des Moines Parent Involvement Study

	Center-Only (n = 29)	Center + PIE (n = 31)
GRADE		
Preschool/Kindergarten[^]	7	6
1st	4	7
2nd	5	3
Mixed Grade[*]	13	14
MAINSTREAMED[#]		
Not Mainstreamed	8	7
Academic Mainstreaming[+]	1	4
Nonacademic Mainstreaming	9	7
All day Mainstreaming	3	3
PRIMARY PLACEMENT		
Typical Class	1	6
Typical Class + Resource	7	4
Self-Contained Class	21	21

[*] All mixed grade were in self-contained placements

[+] Includes academic and nonacademic mainstream placements, as long as subject is mainstreamed for some academic subjects.

[^] Child may remain in a preschool placement through age six.

[#] Only includes children who are not in a typical class placement.

Comparative information on child-classroom placement variables (using t-test analyses) are presented in Table 8.21. No significant differences were found on any of the variables examined except for percent in a typical classroom placement without special services. Significantly more subjects in the Center + PIE group are in a typical placement. Overall, the majority of children remain classified in special education. There is a trend for subjects in the Center + PIE group toward more preferred outcomes based on the finding of all positive effect sizes. However, the failure to find statistically significant differences requires that longitudinal findings be obtained to confirm or refute this trend.

Table 8.21

Teacher Reported Data Cross-Reassessments #3 and #4 for Des Moines Parent Involvement Study

		Center-Only			Center + PIE				
Variables	Covariates*	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Chronological age of child in months on 6/1/90		92.3	(14.5)	29	94.6	(12.2)	32	.50	.16
• Child Variables♦									
Percent in self-contained♣ placement		72.4		29	67.7		31	.70	.12
Percent in typical classroom placement without related services		3.5		29	19.4		31	.05	.72
Percent with special♣ education classification		93.1		29	83.9		31	.27	.39
• Ratings of Parents♠									
Attendance	1,2	2.4	(.7)	26	2.5	(.7)	31	.34	.14
Knowledge	1,2	2.1	(.8)	26	2.2	(.7)	31	.39	.13
Cooperation	1,2	2.2	(.7)	26	2.4	(.8)	31	.36	.29

* Covariates: 1 = Income, 2 = Mother's Education

♦ Statistical analyses for these variables were based on a t-test where subjects possessing the trait were scored "1" and those not possessing the trait were scored "0." ESs for these variables are based on a probit transformation.

♠ Parent ratings are scored from 1 to 3, where higher scores are preferred. Adjusted means are presented.

^ $$\text{ES} = \frac{x\ (\text{Center + PIE}) - x\ (\text{Center-Only})}{\text{SD (Center-Only)}}$$

♣ The sign of the effect size for these variables was reversed as lower percentages are preferred.

Teachers were also asked to rate parents in three areas (attendance, knowledge, and cooperation) based on their interactions with the parents. Statistically significant differences were not found on teacher ratings of parent attendance, knowledge (i.e., at PTA meetings, IEP meetings, parent-teacher conferences, familiarity with IEP process, etc.), and cooperation.

Reassessment #4. The protocol for collecting school-related information from the teachers was changed during this reassessment to affect the use of a consistent format across all Longitudinal Institute studies. An additional protocol was used at this site to keep data comparable to the cross-reassessment data.

The teachers of 70 subjects were contacted based on parental permission to obtain school-related information. Protocols were returned on 60 subjects, 46 were Cohort #1 subjects and 14 were Cohort #2 subjects.

Information obtained from these teachers is presented in Table 8.22 and 8.23. Table 8.22 presents descriptive information similar to that presented in Table 8.20. The information on Table 8.22 presents a descriptive picture similar to that presented in table 8.20.

Comparative information on child-classroom placement variables (using t-test analyses) are presented in Table 8.23. The information and results presented in this table mirror the information presented in Table 8.21. Once again, a statistically significant difference was found in favor of the Center + PIE group on the variable of typical classroom placement without special services. The positive trends of the cross-reassessment analyses were repeated. If these findings continue longitudinally, a finding that would have been overlooked in earlier analyses, and one that has potential cost-benefit impacts, would be verified.

Teachers were, once again, asked to rate parents in three areas. The areas and results of analyses are presented in Table 8.23. No statistically significant differences were found.

School information at reassessment vs. cross-reassessment. One of the purposes of the analyses presented in this section was to examine the robustness of the school data as reported at different times. The analyses in this section had similar results. School information data, for future analyses, will be presented by reassessment.

Table 8.22

Descriptive Information on School Placement at Reassessment #4 by Numbers of Subjects for Des Moines Parent Involvement Study

	Center-Only (n = 29)	Center + PIE (n = 31)
GRADE		
Preschool/Kindergarten[^]	6	4
1st	4	6
2nd	7	6
3rd	2	2
Mixed Grade[*]	10	13
MAINSTREAMED[#]		
Not Mainstreamed	2	2
Academic Mainstreaming[+]	3	1
Nonacademic Mainstreaming	13	10
All day Mainstreaming	10	12
PRIMARY PLACEMENT		
Typical Class	1	6
Typical Class + Resource	6	6
Self-Contained Class	22	19

[*] All mixed grade were in self-contained placements

[+] Includes academic and nonacademic mainstream placements, as long as subject is mainstreamed for some academic subjects.

[^] Child may remain in a preschool placement through age six.

[#] Only includes children who are not in a typical class placement.

Analysis of One Year vs. Two Years of Intervention

In the analyses presented earlier for Reassessments #2, #3, #4, and #5, the existence of a possible confound was mentioned. This possible confound is that the Center + PIE group consists of subjects who received two years of parent involvement intervention and subjects who received one year of parent involvement intervention. The analyses reported in this section was conducted to determine the effects of these different durations of parent involvement on the data collected.

Table 8.23

Teacher Reported Data at Reassessment #4 for Des Moines Parent Involvement Study

		Center-Only			Center + PIE				
Variables	Covariates*	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
· Child Variables♦									
Percent in self-contained♣ placement		75.9		29	61.3		31	.23	.38
Percent in typical classroom placement without related services		3.4		29	19.4		31	.05	.72
Percent with special♣ education classification		93.1		29	83.9		31	.27	.39
· Ratings of Parents♠									
Attendance	1,2	2.4	(.7)	26	2.7	(.7)	31	.31	.43
Knowledge	1,2	2.1	(.7)	26	2.3	(.7)	31	.28	.29
Cooperation	1,2	2.2	(.8)	26	2.5	(.7)	31	.19	.38

* Covariates: 1 = Income, 2 = Mother's Education

♦ Statistical analyses for these variables were based on a t-test where subjects possessing the trait were scored "1" and those not possessing the trait were scored "0." ESs for these variables are based on a probit transformation.

♠ Parent ratings are scored from 1 to 3, where higher scores are preferred. Adjusted means are presented.

^ $$ES = \frac{x \text{ (Center + PIE)} - x \text{ (Center-Only)}}{\text{SD (Center-Only)}}$$

♣ The sign of the effect size for these variables was reversed as lower percentages are preferred.

A oneway analysis of covariance was conducted on all child and family outcome measures, reported earlier, for Reassessments #2, #3, #4, and #5. The groups compared were the Center-Only group, the group who received one year of the parent involvement intervention (Center + PIE), and the group who received two years of the parent involvement intervention (Center + PIE I + PIE II). Covariates used in the analyses were the same as those reported for each measure on the earlier analyses (Tables 8.16 - 8.18).

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The majority of results from these analyses are presented in Table 8.24. This table does not present data on all measures in order to simplify the table. Any measure where a significant difference between groups was found is presented in the table.

No statistically significant differences were found on the majority of the measures. The measures on which a significant difference ($p \leq .10$) was found are presented with further analyses in Table 8.25. Overall, the results from Table 8.24 suggest that the different durations of participation in the parent involvement component did not impact on outcome measures.

Table 8.25 presents information regarding the direction of differences for the measures on which a significant difference was found in Table 8.24. This table presents the effect size for each possible two-group comparison and a probability value based on that effect size.

Reassessment #2. It is interesting to note that the group (Center + PIE I + PIE II) who received the most parent involvement reported the highest levels of depression symptomatology, significantly more than the Center-Only group. However, family cohesion was lowest for the Center + PIE I group, significantly more so than either of the other two groups. Logically, the CES-D and cohesion results should not co-occur, suggesting that chance factors may play a role in these findings.

On the chance scale of the CIQ, the results indicate that the Center + PIE I + PIE II attributed significantly less of their child's progress to chance than either the Center-Only group or the Center + PIE I group. In fact, the Center-Only and Center + PIE I groups did not differ on this measure. Also, the Center + PIE I + PIE II group attributed significantly more of their child's progress to professionals than the Center + PIE I group, while the Center-Only group attributed significantly less of their child's progress to professionals than the Center + PIE I group.

A difference was also found on the total score of the PAAT. Both the center + PIE I and Center + PIE I + PIE II groups reported more appropriate behaviors in

Table 8.24

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

	Center-Only			Center + PIE I			Center + PIE I + PIE II				
Variables˜	Adj.$\bar{x}$	(SD)	n	Adj.$\bar{x}$	(SD)	n	Adj.$\bar{x}$	(SD)	n	ANCOVA F	p Value
Reassessment #2											
• **Battelle Developmental Inventory**											
Personal/Social	130.9	(25.4)	37	128.3	(34.1)	14	132.8	(31.0)	19	.24	.79
Adaptive Behavior	85.6	(18.0)	37	87.2	(20.3)	14	87.8	(18.0)	19	.30	.74
Motor	116.3	(24.8)	37	113.5	(34.6)	14	116.7	(30.9)	19	.36	.70
Communication	67.6	(18.9)	37	65.8	(24.8)	14	69.2	(21.7)	19	.34	.71
Cognitive	65.1	(23.0)	37	62.9	(24.9)	14	69.6	(24.9)	19	1.31	.28
TOTAL	463.5	(97.7)	37	461.0	(129.2)	14	474.7	(115.9)	19	.38	.69
• **Parenting Stress Index (Total)♦**	249.3	(35.5)	35	246.0	(21.9)	13	254.1	(48.3)	19	.38	.68
• **Family Adaptation and Cohesion♣ Evaluation Scales**											
Cohesion	37.0	(7.2)	34	33.7	(6.2)	14	39.1	(7.0)	18	4.99	.01
Adaptation	21.2	(5.4)	34	21.0	(4.8)	14	19.7	(5.5)	18	.57	.57
• **CES-D♦**	29.4	(6.7)	36	32.1	(10.7)	14	34.7	(13.0)	19	2.58	.08
• **Child Improvement Questionnaire**											
Professional	19.9	(4.5)	36	17.2	(3.4)	13	20.7	(3.5)	19	3.14	.05
Divine Intervention	11.2	(3.4)	36	12.5	(2.9)	13	11.2	(4.0)	19	.80	.46
Parent	23.8	(2.8)	36	23.4	(3.6)	13	24.3	(2.9)	19	.38	.69
Child	21.4	(4.0)	36	20.5	(3.3)	13	19.3	(3.9)	19	2.27	.11
Chance	12.7	(4.6)	36	11.3	(3.3)	13	8.6	(2.8)	19	6.54	.00
TOTAL	88.8	(14.3)	36	85.4	(9.6)	13	83.9	(9.2)	19	.96	.39
• **Parent as a Teacher (PAAT)**											
Creativity	26.7	(1.6)	34	26.4	(1.3)	13	27.5	(3.3)	19	1.27	.29
Frustration	27.1	(2.1)	34	26.0	(1.6)	13	27.1	(3.7)	19	1.08	.35
Control	25.7	(2.7)	34	26.7	(2.0)	13	27.2	(3.0)	19	1.97	.15
Play	28.8	(2.5)	34	28.3	(1.9)	13	30.0	(3.3)	19	2.09	.13
Teaching/Learning	28.7	(2.7)	34	29.4	(2.2)	13	30.0	(3.4)	19	1.49	.23
TOTAL	136.9	(8.3)	34	136.1	(5.1)	13	142.3	(14.1)	19	2.64	.08

(continued)

♣ Scores for the FACES are derived from linear scoring.

♦ Lower scores are preferred

˜ Adjusted means are presented. Covariates used were the same as those reported in Tables 8.16 - 8.18.

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Table 8.24 (continued)

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

Variables^	Center-Only			Center + PIE I			Center + PIE I + PIE II			ANCOVA F	p Value
	Adj.$\bar{x}$	(SD)	n	Adj.$\bar{x}$	(SD)	n	Adj.$\bar{x}$	(SD)	n		
Reassessment #3											
• **Battelle Developmental Inventory**											
Personal/Social	144.5	(17.2)	37	143.2	(29.8)	13	147.3	(26.6)	18	.29	.75
Adaptive Behavior	94.5	(15.5)	37	93.8	(20.6)	13	98.9	(22.0)	18	1.01	.37
Motor	124.8	(23.1)	37	124.4	(34.2)	13	126.5	(32.4)	18	.14	.87
Communication	77.5	(20.9)	37	74.4	(29.3)	13	79.4	(21.8)	18	.53	.59
Cognitive	76.7	(22.8)	37	68.5	(27.1)	13	77.9	(24.7)	18	2.03	.14
TOTAL	517.6	(89.0)	37	508.0	(135.1)	13	526.7	(117.7)	18	.42	.66
• **Parenting Stress Index (Total)♦**	247.4	(34.4)	37	237.9	(32.8)	13	244.0	(52.7)	18	.46	.63
• **Family Adaptation and Cohesion♣ Evaluation Scales**											
Cohesion	37.7	(6.7)	36	36.8	(6.0)	13	39.9	(4.6)	18	2.05	.14
Adaptation	21.8	(5.7)	36	22.8	(5.5)	13	20.7	(4.6)	18	.73	.48
• CES-D♦	30.6	(9.4)	37	31.4	(9.4)	12	29.9	(8.0)	18	.13	.88
• **Child Improvement Questionnaire**											
Professional	18.3	(4.2)	37	17.0	(4.8)	13	20.1	(3.3)	18	2.21	.12
Divine Intervention	12.5	(3.6)	37	11.6	(4.2)	13	12.0	(3.1)	18	.33	.72
Parent	22.4	(3.9)	37	23.2	(3.2)	13	24.4	(2.2)	18	2.28	.11
Child	20.8	(3.0)	37	21.7	(4.5)	13	21.1	(3.4)	18	.34	.71
Chance	11.5	(4.1)	37	10.9	(3.4)	13	9.1	(2.4)	18	3.85	.03
TOTAL	85.5	(12.8)	37	84.6	(13.1)	13	86.1	(7.1)	18	.08	.93
• **Parent as a Teacher (PAAT)**											
Creativity	26.9	(1.8)	33	26.6	(1.9)	12	26.6	(2.1)	18	.26	.77
Frustration	27.0	(1.9)	33	26.2	(1.9)	12	28.0	(2.9)	18	3.16	.05
Control	25.5	(2.8)	33	27.6	(2.4)	12	27.2	(2.6)	18	3.85	.03
Play	29.1	(2.6)	33	29.0	(2.6)	12	30.5	(2.6)	18	2.41	.10
Teaching/Learning	29.2	(2.8)	33	28.5	(2.4)	12	30.3	(2.6)	18	2.01	.14
TOTAL	137.2	(8.4)	33	139.0	(7.6)	12	142.1	(9.8)	18	1.80	.17

(continued)

♣ Scores for the FACES are derived from linear scoring.

♦ Lower scores are preferred

^ Adjusted means are presented. Covariates used were the same as those reported in Tables 8.16 - 8.18.

Table 8.24 (continued)

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

Variables	Center-Only			Center + PIE I			Center + PIE I + PIE II			ANCOVA F	p Value
	Adj.$\bar{x}$^	(SD)	n	Adj.$\bar{x}$^	(SD)	n	Adj.$\bar{x}$^	(SD)	n		
Reassessment #4											
• **Woodcock-Johnson**											
Broad Knowledge	45.0	(13.0)	37	43.6	(17.3)	15	47.6	(16.6)	19	.69	.50
Skills	45.9	(24.1)	37	41.5	(23.4)	15	48.3	(25.6)	19	.74	.48
• **Scales of Independent Behavior**											
Motor	457.0	(22.6)	36	454.8	(40.6)	15	462.6	(41.1)	19	.75	.48
Social & Communication	463.5	(14.8)	37	462.7	(22.2)	15	467.5	(19.7)	19	.89	.42
Personal Living	467.5	(17.6)	35	470.5	(25.4)	15	469.2	(25.2)	19	.27	.76
Community Living	441.2	(24.0)	36	454.1	(23.80	15	444.5	(26.7)	19	.88	.42
TOTAL	457.3	(17.5)	35	460.1	(26.8)	15	460.6	(26.7)	19	.46	.64
• **Parenting Stress Index (Total)**♦	241.5	(46.0)	36	232.2	(31.6)	14	241.2	(44.4)	18	.50	.61
• **Family Adaptation and Cohesion**♣ **Evaluation Scales**											
Adaptation	21.1	(5.2)	36	22.1	(5.1)	14	22.2	(4.0)	18	.46	.63
Cohesion	37.8	(6.8)	36	37.0	(5.9)	14	39.8	(6.7)	18	1.18	.32
• **Child Improvement Questionnaire**											
Professional	19.3	(4.2)	36	16.9	(4.3)	14	19.3	(3.5)	18	1.88	.16
Divine Intervention	11.7	(3.2)	36	12.3	(2.7)	14	11.0	(4.1)	18	.57	.57
Parent	23.1	(3.9)	36	21.7	(5.0)	14	24.6	(3.0)	18	2.21	.12
Child	21.4	(2.6)	36	19.1	(7.0)	14	21.3	(4.5)	18	1.74	.18
Chance	11.0	(3.7)	36	11.8	(4.8)	14	9.5	(2.9)	18	2.15	.13
TOTAL	86.1	(9.7)	36	82.0	(9.8)	14	86.1	(9.7)	18	1.28	.29
• **Parent as a Teacher (PAAT)**											
Creativity	26.4	(2.5)	36	26.5	(1.3)	14	26.0	(2.3)	18	.34	.71
Frustration	27.7	(2.7)	36	26.1	(.8)	14	27.1	(1.7)	18	2.82	.07
Control	25.7	(2.4)	36	26.9	(1.9)	14	25.8	(2.5)	18	1.83	.17
Play	29.3	(2.4)	36	28.6	(1.8)	14	28.9	(2.1)	18	.66	.52
Teaching/Learning	29.6	(3.6)	36	28.9	(2.9)	14	28.9	(2.8)	18	.45	.64
TOTAL	138.8	(10.1)	36	137.1	(5.5)	14	136.4	(8.2)	18	.48	.62
• **SPECS**											
Communication	6.4	(1.6)	28	7.1	(1.4)	14	7.3	(1.7)	17	2.00	.01
Sensorimotor	16.0	(2.8)	28	16.5	(2.6)	14	17.4	(2.9)	17	1.53	.23
Physical	12.3	(1.8)	28	12.6	(2.2)	14	13.4	(1.9)	17	1.78	.18
Self-Regulation	13.8	(3.2)	28	15.8	(3.3)	14	15.7	(2.8)	17	2.91	.06
Cognition	5.7	(2.2)	28	6.4	(1.6)	14	7.7	(1.7)	17	5.89	.01
Self/Social	13.0	(3.3)	28	14.9	(3.4)	14	15.8	(2.7)	17	5.37	.01

♣ Scores for the FACES are derived from linear scoring.

♦ Lower scores are preferred

^ Adjusted means are presented. Covariates used were the same as those reported in Tables 8.16 - 8.18.

Table 8.24 (continued)

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

Variables	Center-Only			Center + PIE I			Center + PIE I + PIE II			ANCOVA F	p Value
	Adj.$\bar{x}^{\wedge}$	(SD)	n	Adj.$\bar{x}^{\wedge}$	(SD)	n	Adj.$\bar{x}^{\wedge}$	(SD)	n		
Reassessment #5											
• **Woodcock-Johnson**											
Broad Knowledge	467.5	(19.3)	38	466.9	(26.3)	15	466.9	(24.6)	18	.01	.99
Skills	432.6	(40.6)	38	432.4	(42.0)	15	435.1	(53.0)	18	.04	.96
• **Scales of Independent Behavior**											
Motor	462.3	(22.3)	38	457.0	(38.1)	15	461.0	(38.1)	18	.42	.66
Social & Communication	467.7	(13.6)	38	465.3	(18.2)	15	471.1	(17.0)	18	1.01	.37
Personal Living	474.4	(15.0)	38	469.0	(25.5)	15	474.4	(24.8)	18	.95	.39
Community Living	452.6	(25.8)	38	452.9	(23.8)	15	452.5	(24.1)	18	.00	1.00
TOTAL	464.0	(16.8)	38	461.9	(25.4)	15	464.5	(23.8)	18	.16	.86
• **Comprehensive Evaluation of Family Functioning**	76.9	(21.0)	35	73.8	(26.4)	13	79.3	(17.9)	17	.32	.73
• **Child Improvement Questionnaire**											
Professional	18.4	(4.1)	35	16.7	(3.8)	13	20.3	(5.3)	17	2.51	.09
Divine Intervention	12.0	(3.0)	32	12.1	(2.4)	13	12.2	(4.0)	17	.04	.96
Parent	23.6	(2.5)	35	22.3	(3.5)	13	25.8	(2.9)	17	5.40	.01
Child	20.8	(3.1)	32	21.1	(3.1)	13	21.5	(4.9)	17	.26	.77
Chance	10.2	(4.0)	33	10.4	(2.5)	13	10.6	(5.2)	17	.08	.92
• **Harter Perceived Self-Concept Inventory**											
Cognitive Competence	20.6	(2.3)	34	20.7	(1.9)	14	21.3	(2.3)	14	.54	.59
Peer Acceptance	16.8	(4.2)	37	20.1	(2.8)	14	16.3	(6.1)	14	3.37	.04
Physical Competence	19.1	(3.4)	37	20.4	(2.7)	14	20.7	(3.1)	14	1.93	.16
Maternal Acceptance	16.5	(4.1)	36	18.1	(3.7)	14	17.2	(4.4)	14	.81	.45
• **Social Skills Rating Scale (Parent)**											
Social Skills	88.5	(15.3)	36	85.6	(15.0)	14	92.2	(17.0)	17	.87	.42
Problem Behaviors	116.5	(62.8)	38	92.7	(19.2)	14	110.2	(16.4)	17	1.25	.29

♦ Scores for the FACES are derived from linear scoring.

♦ Lower scores are preferred

^ Adjusted means are presented. Covariates used were the same as those reported in Tables 8.16 - 8.18.

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Table 8.25

Direction of Significant Results from Oneway Analysis of Covariance (Table 8.20) for Des Moines Parent Involvement Study

	Center-Only vs. Center + PIE I		Center-Only vs. Center + PIE I + PIE II		Center + PIE I vs. Center + PIE I + PIE II	
Variable	ES*	$p^{\blacklozenge}$ Value	ES*	$p^{\blacklozenge}$ Value	ES*	$p^{\blacklozenge}$ Value
Reassessment #2						
• CES-D	.34	.29	.60	.04	.22	.55
• Child Improvement Questionnairey						
Professional	-.66	.05	.18	.54	1.02	.01
Chance	-.33	.32	-1.03	.00	-.90	.02
• FACES Cohesion	-.53	.10	.29	.32	.87	.02
• PAAT Total	-.11	.74	.52	.07	.59	.11
Reassessment #3						
• Child Improvement Questionnaire						
Chance	.27	.42	-.68	.02	-.66	.08
• PAAT						
Frustration	-.43	.21	.49	.10	.76	.05
Play	-.04	.90	.55	.07	.06	.13
Control	-.73	.02	-.25	.39	.76	.04
Reassessment #4						
• PAAT						
Frustration	-.73	.02	-.25	.39	.76	.04
• SPEC						
Communication	.46	.17	.55	.08	.13	.73
Self-Regulation	.62	.06	.62	.05	.03	.93
Cognition	.35	.29	.99	.00	.79	.04
Self/Social	.57	.09	.91	.01	.30	.42
Reassessment #5						
• Harter Perceived Self-Concept Inventory						
Peer Acceptance	.86	.01	-.11	.74	.85	.03
• Child Improvement Questionnaire						
Professional	-.42	.20	.42	.15	.77	.04
Parent	-.47	.15	.84	.01	1.11	.01

[*] ES was computed by subtracting the Adj.$\overline{x}$ of the second listed group from the mean of the first listed group and dividing this by the pooled for the two groups. For example:

$$\frac{\text{Adj.}\overline{x}\ (\text{Center + PIE + PIE II})) - \text{Adj.}\overline{x}\ (\text{Center + PIE I})}{\text{SD (Pooled)}}$$

teaching interactions with their child. The center + PIE I and Center + PIE I + PIE II groups were not different on this measure.

Reassessment #3. The significant finding on the CIQ chance subscale reflect those found at Reassessment #2. The findings on the PAAT suggest that the Center + PIE I + PIE II group was less frustrated, more appropriately playful, and more appropriately controlling with their child in teaching interactions than the Center-Only group. The Center + PIE I and Center + PIE I + PIE II groups significantly differed on their frustration levels in teaching interactions, with the Center + PIE I + PIE II group reporting less frustration. The Center + PIE I and Center + PIE I + PIE II groups also reported more appropriate control methods in teaching interactions than the Center-only group. These findings on the PAAT are consistent with the PAAT Reassessment #2 results.

Reassessment #4. The results from Reassessment #4 are interesting in that some differences are in areas of child functioning, as reported by the teacher (SPECS), rather than in areas assessing parent perceptions. The results in Table 8.25 suggest an advantage for children whose parents were in the Center + PIE I + PIE II group over the other group and for the Center + PIE I group, over the Center-Only group in the areas of cognition and self-social behaviors. Both intervention groups are favored over the Center-only group in the self-regulation and communication area.

The findings from the frustration scale of the PAAT have shifted from those that occurred at Reassessment #3. At Reassessment #3, the Center-Only group reported more frustration in teaching interactions. At posttest #4, these perceptions of frustration are significantly greater from the Center + PIE I group. This drastic change in group significance suggest that either chance factors affected earlier results or that changes in parent attitudes have occurred.

Reassessment #5. The statistically significant findings on the CIQ is slightly different than earlier reassessments but tends to confirm the perceptions at Reassessment #2 and #3. That is, parents in the Center + PIE I and PIE II group tend to view themselves and professionals as having a greater impact on their child's progress than either of the two groups. Also, the Center + PIE I group appears no different than the Center-only group.

The scores from the Perceived Self-Competence Inventory indicate that the children in the Center + PIE I group view their peer acceptance more favorably than children in either of the other two groups. This finding is not consistent with the results of the Social Skills Rating Scale. This finding may be spurious but will be checked at future reassessments.

Conclusions

This study investigated the effect on children, parents, and families of placement in a center-based early intervention program supplemented by parent-attended meetings focused primarily on training parents intervention skills, compared to the same program without the parent component. Results of this study indicate that the supplemental parent involvement component had a minor impact on children's developmental progress immediately after intervention, but this progress was not maintained over time nor by the continuation of a parent involvement intervention. Perceptions of family social support were also impacted positively by the parent involvement component immediately following intervention. However, the only aspect of parent or family functioning consistently impacted was that parents who received the parent involvement component were less likely than other parents to attribute their child's developmental progress to chance. The findings immediately following interventions are similar to those found by Boyce with a similar intervention in the Utah Parent Involvement Study (included in this annual report).

These impacts occurred at a cost of approximately $1,700 per child per year for the parent involvement component. The limited positive outcomes combined with this level of cost makes determination of cost-effectiveness difficult. Although not reflected in the parent satisfaction data, anecdotal reports of greater involvement in their child's education have been reported by staff of the Des Moines Intervention Program. These qualitative data are difficult to assign a value to.

It is difficult to succinctly summarize the results of such a comprehensive study. There are measures where a statistically significant difference is found at one posttest but not the next. It is difficult to determine if these differences reflect benefits of the program or random fluctuations within a large data set. Actual differences must be demonstrated by consistent findings within a posttest and across posttests. Such consistency was not evidenced on the majority of measures.

Data from longitudinal aspects of this study that are examining teacher judgments and child classroom placements are providing some initial results in favor of the Center + PIE group. These results suggest the teacher's perceive children of parents in this group as being more appropriate, and more subjects from this group are in typical classroom placements. These findings speak directly to the importance of longitudinal research. If these positive teacher reports continue for the parent involvement group, then it would suggest an impact of intervention not captured by other measures. These types of findings also highlight the need for funding of cost-benefit studies to build on our earlier cost data. Continued collection of longitudinal data of teacher reports will provide important information on the impact of the parent involvement intervention.

It is clear that the parent component used in this study is only one type of parent involvement possible from a continuum of parent involvement options. The parent component used in this study, though, is representative of the most common approach to parent involvement (White et al., 1992) (i.e., parent meetings focused on training intervention skills as a supplement to a center-based program). The findings from this study do not imply that parent involvement is not beneficial nor that parents cannot be effective interventionists for their child with disabilities. These results only imply that parent involvement, when conducted as described in this study, do not provide long-term benefits for child development or for family functioning on the outcome measures used; measures which are commonly used in early intervention and family research. However, these results suggest some small effects on children's development following intervention and some early indications of differences on teacher report data as children progress through school.

In interpreting the results of this study, it should be remembered that parent attendance at meetings was far from perfect. However, attendance at parent meetings in this study typifies findings when using lower SES groups (Baker & McCurry, 1984) and medically at-risk children (Ramey et al., 1992). Regardless of attendance, parents learned the concepts taught in PIE I (as demonstrated by the test of Parent Knowledge), at least at a level that allowed them to verbalize information presented. This is probably due to the repeated presentation of critical knowledge in PIE, as in many other parent curricula providing information (Innocenti, Rule, & Fiechtl, 1989). These factors further support the "typical" nature of this intervention.

This study represents a methodologically-sound analysis of adding one type of parent involvement to an existing center-based early intervention program. The results of this study do not endorse this type of intervention if the goal is to make a sustained impact on child development or family functioning. This type of parent involvement may be defensible from a social/ethical perspective and from a school success perspective.

Regardless of arguments for or against this type of parent involvement, this study demonstrates that questions regarding parent involvement can be addressed with methodologically sound experimental studies. Research such as this will help to define not only what types of parent involvement "work," but will also help the field of early intervention elucidate its arguments for involving parents. Whatever the role of parents is determined to be, it should be one that is both empirically and logically defensible.

UTAH PARENT INVOLVEMENT STUDY (1986)

Project #9

Comparison: Children with Moderate to Severe Disabilities--Center-based intervention plus parent involvement versus center-based intervention only.

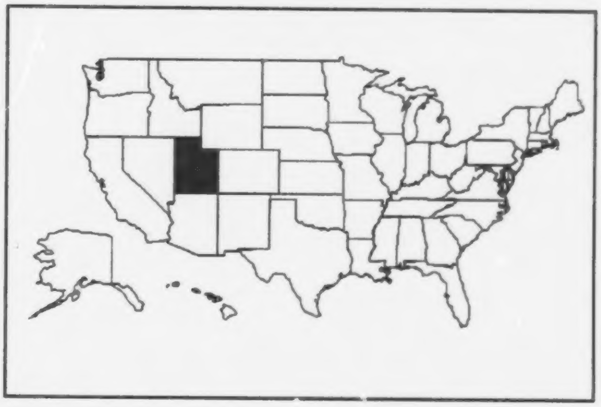
Local Contact Person: Don Link, Director, Developmental Disabilities, Inc.

EIRI Coordinator: Glenna C. Boyce, Ph.D.

Location: Salt Lake City, Utah

Date of Report: 10-1-1992

Rationale for Study



The belief that early intervention programs which involve parents are more effective than programs that do not is widely accepted (Bronfenbrenner, 1974; Garland, Swanson, Stone, & Woodruff, 1981; Johnson & Chamberlin, 1983; Karnes & Lee, 1978; Lazar, 1981; Parker & Mitchell, 1980; Simeonsson et al., 1982). This belief is based on the premise that if parents lack the skills conducive to optimal child development, these skills can be taught. Consequently, parent instruction became an integral part of early intervention programs developed in the early 1960s to help children who were environmentally at risk (e.g., Head Start).

As the field of early intervention for children with disabilities developed, parent instruction became a part of many of the intervention programs (White, Mastropieri, & Casto, 1984), following the philosophy and model of the environmentally at-risk intervention services. Through the years, parents have been involved in intervention programs in a variety of ways. The most common method has been to train parents to stimulate and encourage, through management and engagement skills, the development of the child's abilities (White et al., 1992). Additionally, these instructional programs often provided a parental support network with professionals and other parents, presented general child development principles, and provided information about available intervention services (McConachie, 1986). The belief that early intervention programs are more effective if parents are involved has continued to the present time. Public Law 99-457, which requires every child with disabilities to have an Individualized Family Service Program (IFSP), demonstrates the government's support of parent involvement in the intervention process.

In spite of the widespread belief that early intervention programs for children with disabilities are more effective when parents are involved, there is little empirical evidence to support this view (Casto & Mastropieri, 1986; White et al., 1992). Anecdotal reports and poorly designed research have provided much of the evidence for these beliefs. Few studies used design elements (such as comparison groups, random assignment, pre- and posttesting) that contribute to methodologically sound research. Similarly, effects measured usually have been limited to short-term effects on child intelligence or development. Long-term investigations or investigations of parent or family effects have been limited.

Therefore, the purpose of this study was to investigate the immediate and long-term effects of adding parent involvement component to an existing early intervention program. The parent involvement program investigated was designed to involve parents in providing intervention activities for their children, assisting parents in working with interventionists, and, through the medium of the instructional sessions, provide a support group including the instructors and other parents. Both the effects on the developmental progress of children with disabilities and the effects on family functioning were examined immediately upon completion of the instruction and annually thereafter.

Review of Related Research

Historically, the involvement of parents in their children's education has been considered to be a vital component of successful programs for both typical and disadvantaged children (Clarke-Stewart, 1982). Founded upon a belief in the importance of parent-child interaction and built on the idea that families were the primary source of values and behaviors of children, parent involvement of different types has been seen by many social scientists, practitioners, and advocates as a way to solve a variety of societal problems. Therefore, parent education became an important part of the government's social policy. The Head Start program, for example, which served as a guide for many subsequent early intervention projects, included a parent involvement component as an integral part of its activities. Bronfenbrenner's (1974) report on early intervention programs was especially influential in arguing that early intervention with children who are disadvantaged was more effective when parents were involved in the program, asserting that the increased participation of parents provided the value change that led parents to encourage and reward their children's learning activities. Lazar's (1981) oft cited analysis of 14 studies of early intervention for children who were disadvantaged reaffirmed this contention by stating that direct participation of parents was significantly related to positive program outcomes.

The benefits associated with parent involvement are believed to be well established with all children, but most of the evidence comes from studies done with children who are disadvantaged. IQ gains and fewer special education placements (Haskins & Adams, 1982), children's increased sociability and cooperation (Clarke-Stewart, 1982), increased infant responsiveness, improvement in children's school performance, and positive effects on maternal behavior (e.g., more facilitative language, flexible child-rearing patterns, awareness of parental role as educator) (Powell, 1986) have been reported as probable benefits from different types of parent involvement/education programs. It is not known whether these benefits are true with the population of children with disabilities.

As early intervention for children with disabilities increased, practitioners believed that parent involvement increased the efficacy of the intervention, following the philosophy of the intervention with disadvantaged children. Foster, Berger, and McLean (1981, p. 55) summed the general acceptance of the importance of parent involvement by the early intervention community when they noted that "Parent involvement is a good idea that has become an essential and often unquestioned component of intervention programs for young handicapped children." Likewise, White, Bush, and Casto (1985-86), in their extensive review of reviews of early intervention effectiveness research, found parental involvement the most frequently cited characteristic contributing to effective early intervention programs.

The belief that early intervention programs for children with disabilities will be more effective if parents are involved has continued to the present time. Public Law 99-457, which established what amounts to a mandate of early intervention programs for all children with disabilities, requires every child to have an Individualized Family Service Program (IFSP). This requirement which underscores the need to have parents and other family members substantially involved in their child's early intervention program.

In spite of the widespread belief that early intervention programs for children with disabilities will be more effective if parents are involved, the hypothesis has seldom been systematically tested using well-controlled research. As White et al. (1992) concluded in their extensive review of the research that investigated the benefits of involving parents in early intervention programs:

> *...Much of the perception that parent involvement is beneficial has been based on anecdotal reports and poorly designed research....Carefully designed research should help us to balance our hopes with reality. (p. 119)*

Design elements (e.g., comparison groups, random assignment, pre- and posttesting) that help ensure sound research have often been missing (Guralnick, 1991; White et al., 1992). Treatment verification (i.e., processes to ensure that the desired intervention took place) have seldom been included in the research design (Guralnick, 1991).

Also, much of the research has provided only indirect evidence as to the effectiveness of parent involvement. Most research has been concerned with demonstrating the overall effectiveness of a program. When several intervention components (e.g., length, intensity, program content, and parent involvement)are included, it is impossible to sort out which components caused which effects (Clarke-Stewart, 1982).

Outcome variables have also been limited. Thus far, child development or IQ has been the predominant outcome variable (Casto & Mastropieri, 1986; Dunst, Snyder, & Mankinen, 1989). Studies have not been concerned with family effects, although many researchers have argued that the family or parent benefits of parent involvement are greater than those demonstrated by the target child (Dunst, 1986). Reviewers have also argued for the investigation of long-term effects (Innocenti & White, in press).

Several studies were identified by White and associates (1985-86) that investigated whether early intervention programs for children with disabilities which involved parents were more effective than similar intervention programs which did not involve parents (Barnett et al., 1988; Boyce, 1991a, b; Henry, 1977; Innocenti, 1991; Miller, 1981; Minor, Minor, & Williams, 1983; Scherzer, Mike, & Ilson, 1976). Most of those studies suffered from serious methodological weaknesses (White et al., 1992). The majority found statistically non-significant results attributable to parent involvement, with the studies which were rated as the most carefully controlled finding the smallest effects attributable to parent involvement. In recommending that more research on this important topic was needed, White et al. (1992) pointed out that persuasion and politics concerning the benefits of parent involvement in early intervention programs have gone far beyond the available scientific evidence. Clearly, the need for additional research is indicated.

This study was designed to respond to the need for further research in this area. The hypothesis being tested was that a center-based early intervention program for young children with moderate to severe disabilities would be more effective for participating children and families if parents were involved, than a similar center-based program with minimal parent involvement. To test that hypothesis, an existing high-quality, center-based intervention program which had minimal parent involvement was identified and children were randomly assigned to one of two groups. In both groups, children participated in the same center-based early intervention program, but in one group parents were extensively involved. In the other group, parents continued the minimal level of involvement which existed previously.

The choise of the particular parent involvement program was determined by a review of the literature. Terms like "parent involvement" are so broad they can refer to a number of very different types of activities. For example, some of the parent involvement literature focuses on the partnership between families and schools (e.g., Epstein, 1990; Epstein & Kroft, 1989). Other literature focuses on programs designed to teach effective parenting and child-rearing skills (e.g., Gamson, Hornstein, & Borden, 1989; Nye, 1989). Still others focus on the appropriate role of parents in the normal developmental process (e.g., Vartuli & Winter, 1989; White, 1975). Although all of these are important aspects of the broad area of parent involvement, the focus of this study was on parent involvement in early intervention programs as defined by McConachie (1986) in which parent involvement includes one or more of the following components.

- Teaching parents specific intervention skills to assist them in becoming more effective change agents with their child.
- Providing social and emotional support to family members.
- Exchange of information between parents and professionals.
- Participation of parents as team members (e.g., in assessment or program planning).
- Development of appropriate parent/child relationships.

- Assisting parents in accessing community resources.

A similar description of parent involvement in early intervention is given by Peterson and Cooper (1989).

Using such definitions, White et al. (1992) did a content analysis of 172 early intervention research studies which had involved parents in a substantial way. Based on that study, they concluded that the most frequent way that parents were involved in the reported early intervention research literature was to train the parent to care for, stimulate, and teach their child, including training on how to best manage the child and/or how to engage the child in activities that will promote optimal development and learning. A substantial number of the studies also provided parents with social and emotional support and taught them basic concepts about child development. Because this was the way in which existing early intervention research most frequently defined parent involvement, it was decided to make such a program the focus of the parent involvement component being tested in this research.

Overview of Study

The purpose of this study was to investigate the effectiveness of adding a parent involvement component with a parent-as-intervener focus to an ongoing center-based intervention program to see if there were benefits for child development or family well-being. Specifically, based on the directions from the literature discussing goals of parent involvement programs, we investigated whether adding this particular parent involvement component influenced (a) child development, (b) later school placement, (c) parental interaction behaviors with child, (d) parents' perceptions of social support, (e) parenting stress, and (f) general family functioning (e.g., family cohesion and adaptability).

To investigate this question, two randomly assigned groups from a sample of 56 preschool children with moderate to severe disabilities were compared. The children were in a 3-hour-per-day, 5-days-per-week, center-based preschool intervention program offered at a private, non-profit agency in Salt Lake City, Utah. The parents of one group attended 15 weeks of parent instruction; the parents in the other group did not. These groups will be referred to as the center-based with parent involvement group and the center-based only group. The curriculum for the parent involvement group sessions was based on the Parent Involvement in Education program (PIE) (Pezzino & Lauritzen, 1986). Assessments, including measures of child development and family functioning, were completed prior to the parent instruction, seven months later (after the instruction was completed), and annually thereafter for six years.

Methods

Subjects

Preschool children with moderate to severe disabilities who were participating in an early intervention program were considered for inclusion in this study. The preschool intervention program was offered through the services of the Developmental Disabilities, Inc. (DDI), a private, non-profit agency located in Salt Lake City, Utah. The Battelle Developmental Inventory was used as a screening instrument to determine children's eligibility for services. Children scoring at least 1½ standard deviations below the mean in two or more developmental areas, or 3 standard deviations below the mean in one area qualified for services at the center.

Recruitment. Parents of eligible children were sent a letter inviting them to participate in the research. The letter explained the study, including the random assignment procedures. No services would be withheld if parents did not want to participate. Sixty-seven parents responded; nine were unable to participate due to reasons such as lack of transportation, illness, etc. Thus, 58 subjects were pretested. Two left the school soon after the pretest, leaving a sample of 56 children. Within this group of children (whose average developmental quotient was

58), a variety of disabilities were represented, including general developmental delay (n = 27), Down syndrome (n = 12), cerebral palsy (n = 7), multidisabled (1), and motor, cognitive, language, or health delay (n = 9).

Assignment to groups. Prior to the initiation of treatment, subjects were randomly assigned to one of two treatment groups: the center-based with parent involvement, or the center-based only group. The children were stratified by age, developmental level, and teacher rating of parent motivation, before being randomly assigned. Parents agreed in advance to the random assignment. Subject recruitment and assignment was completed in November, 1986.

Demographic characteristics. Children ranged in age from 23 to 61 months, with the average age of 42 months when the intervention began. Most of the parents were in their late twenties or early thirties. As a group, the parents were fairly well educated with the average education for both mothers and fathers being more than 13 years. Almost all of the families were Caucasian, and the demographic data indicated that most of them would be considered middle class. Typically, the children were living with both parents and a majority of the mothers (66%) did not report any employment outside the home. An average of two additional siblings were reported. Table 9.1 presents a demographic comparison (based on t-tests) of the center-based only and the center-based with parent involvement groups at the initial assessment.

The p-values and the effect sizes indicate that the two groups were generally comparable in terms of demographic characteristics. Of the 19 variables measures, there were no statistically significant differences on 17. In the center-based with parent involvement group, more families were intact having two parents in the home ($\underline{p}$ value = .04, ES = .47), and more families had other children with disabilities ($\underline{p}$ value = .02, ES = 1.0).

Table 9.1

Comparison on Key Demographic Variables of the Center-Based Only and Center-Based with Parent Involvement Groups in the 1986 Parent Involvement Study

	Center-Based			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Age of child in months as of 11/15/86	43.0	10.5	28	41.7	10.6	28	.62	-.12
• Age of mother in years	33.4	5.8	28	31.9	5.6	28	.33	-.26
• Age of father in years	35.9	6.2	27	33.8	6.4	28	.23	-.34
• Percent Male*	57.1		28	42.9		28	.29	-.26
• Years of Education--Mother	13.8	1.7	28	13.5	1.5	28	.51	-.18
• Years of Education--Father	13.8	2.1	28	14.0	2.1	28	.66	.10
• Percent with both parents living at home*	78.6		28	96.4		28	.04	.47
• Percent of children who are caucasian*	92.9		28	100.0		28	.16	.27
• Hours per week mother employed	8.4	13.7	26	6.4	10.8	28	.55	-.15
• Hours per week father employed	42.8	15.5	21	36.6	18.9	26	.23	-.40
• Percent of mothers employed outside the home*	42.9		28	28.6		28	.27	-.27
• Percent of fathers employed as technical managerial or above*	61.5		26	46.2		26	.28	-.28
• Total household income+	\$21,785	\$12,728	28	\$23,314	\$13,684	27	.67	.12
• Percent with mother as primary caregiver*	96.4		28	100.0		28	.32	.15
• Percent of children in daycare more than 5 hours per week*	10.7		28	3.6		28	.31	-.22
• Number of siblings	2.1	1.7	28	2.3	1.1	28	.71	.12
• Number of siblings with disabilities	.1	.3	28	.4	.7	28	.02	1.00
• Percent with English as primary language*	96.4		28	100.0		28	.32	.15
• Maternal PPVT (standard)\$	99.6	18.0	28	99.3	17.1	27	.97	-.02

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

+ Income data were converted from categorical to continuous data by using the midpoint of each category.

^ Effect size is defined here as the difference between the groups (center + PIE minus center) on the ANCOVA scores, divided by the unadjusted standard deviation of the center-based intervention group. (See Glass, 1976; Tallmadge, 1977; & Cohen, 1977, for a more general discussion of the concept of Effect Size.) The sign of ES only indicates direction of difference; no value judgement is intended.

\$ Maternal PPVT measures mother's receptive vocabulary. It correlates highly with IQ measures. This measure was taken at Reassessment #1, but was considered a assessment variable.

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Attrition. Two subjects dropped out between the time of the initial assessment and Reassessment #1. One of these subjects cited the birth of a new baby and a language barrier (the subject was a recent immigrant) as reasons for dropping out of services altogether. The other subject dropped out of the study because the mother decided to withdraw her child from services at the intervention center. Thus, the sample at Reassessment #1 consisted of 56 subjects, with 28 in each group.

Forty-two families participated in at least part of Reassessment #2; 14 families did not participate. The reasons for non-participation included family problems, moving out of state, and inability of staff to locate subjects. (Standard procedure for locating lost subjects was to (1) contact next of kin, and (2) send a certified letter. For these cases, neither procedure proved successful.) Analyses were performed to determine if those children who were not tested at Reassessment #2 were any different on the assessment and demographic variables from those who were tested. The assessment scores of those tested and those not tested at Reassessment #2 were very similar (see Table 9.2); therefore, the attrition did not appear to influence the reassessment results.

At Reassessment #3, substantial efforts were made to retrieve subjects not tested at Reassessment #2; 51 children and their families completed the measures (25 in the center-based with parent involvement group and 26 in the center-based only group), leaving 5 who were not tested. Two lived in states where testers could not be located. Two mothers refused to participate at Reassessment #2 again refused to be reinstated, and one was not located.

Participation remained high at Reassessment #4 with 52 children and their families tested. All four children who were not tested were from the parent involvement group. Two of these had declined to participate since Reassessment #1, one died in December, 1989, and one's mother declined to participate this year.

Table 9.2

Comparison on Assessment Variables of Subjects Who Withdrew from Study With Those Who Completed Reassessment #2 in the 1986 Utah Parent Involvement Study

								Study Status							
		Center-Based			Center-Based + PIE			In Study			Out of Study				
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p* Value	ES^*
Age at Assessment	IN	42.4	11.9	20	41.6	11.6	20	42.0	11.6	40	43.1	7.1	16	.73	-.09
	OUT	44.5	6.1	8	41.7	8.2	8								
BTR	IN	286.2	72.3	20	296.5	68.5	20	291.3	69.7	40	260.4	98.0	16	.19	.44
	OUT	254.8	75.1	8	266.0	121.9	8								
Parenting Stress Index - PSI	IN	255.7	53.6	20	257.2	31.7	19	256.4	43.8	39	250.4	37.6	16	.63	.14
	OUT	251.3	36.4	8	249.5	41.2	8								
Mother's Education	IN	13.9	1.5	20	13.5	1.5	20	13.7	1.5	40	13.6	1.9	16	.96	.07
	OUT	13.6	2.2	8	13.6	1.8	8								
Income	IN	$22,325	$13,496	20	$23,100	$11,666	/20	$22,712	$12,458	40	$22,066	$15,161	15	.87	.05
	OUT	$20,437	$11,296	8	$23,928	$19,490	7								
Family Adaptability FACES III	IN	25.5	5.9	20	26.1	6.3	20	25.8	6.0	40	23.3	5.3	16	.16	.42
	OUT	22.0	5.2	8	24.6	5.3	8								
Family Cohesiveness FACES III	IN	38.1	9.0	20	39.2	4.9	20	38.6	7.2	40	38.6	4.8	16	1.00	.00
	OUT	37.4	5.6	8	39.9	3.9	8								
Family Resources FRS	IN	113.2	16.9	20	113.3	16.4	19	113.2	16.4	39	114.8	21.8	16	.78	-.10
	OUT	117.8	22.0	8	111.8	22.6	8								
Family Support FSS	IN	27.9	10.8	20	28.2	10.2	20	28.0	10.4	40	30.3	11.9	16	.48	-.22
	OUT	29.4	12.8	8	31.3	11.8	8								

^ $ES = \frac{\bar{x}_{in} - \bar{x}_{out}}{SD_{in}}$

* The p value and ES are based on comparison of study status (i.e., in study, those who were tested at that reassessment versus out of study, those who were not tested at that reassessment). The sign of ES only indicates direction of difference; no value judgment is intended.

Fifty-three children were tested at Reassessments #5 and #6. Those not tested included the two who had not participated since Reassessment #1 and one who died after Reassessment #3.

Comparison analyses of subjects tested at the third, fourth, and fifth reassessments with those not tested at the same reassessment were performed to determine if those children who dropped out of this study were any different on the various assessment and demographic variables from those who remained in the study. None of these analyses revealed statistically significant differences.

Intervention Programs

The purpose of this study was to compare a center-based only intervention group with a center-based intervention group whose parents participated in a particular type of parent involvement. A description of these treatments follows. All children were involved in the center-based early intervention program. The children in both groups were scattered among the classrooms at the center. Classroom teachers may have known their students were in this study, but they were "blind" to group assignment.

Center-Based Intervention Program. Most of the children attended a preschool program three hours per day, five days per week. A few of the children from both groups were involved for part of the year in other intervention programs at the same center, including: a 4-day-per-week preschool, individual therapy (primarily for infants), and a transition program designed to move children from the individual therapy to the preschool program. Children who participated in these other programs (less than 20% of each group) were equally represented in the center-based and the center-based with parent involvement groups.

In the preschool program, each group of 9-12 children was instructed by a special education teacher who was assisted by a paraprofessional aide. The average number of children in the classrooms was 9.75. During a typical day, children were instructed in developmental areas such as motor, speech/language, self help, cognitive, and social skills. Instructional activities were developed from comprehensive assessments. Items were drawn from a number of curricula with no single, specific commercial curriculum being used to determine intervention goals and activities. Children received services in different educational formats (i.e., large group, small groups, and one-to-one) according to their individual needs which had been prioritized on IEPs developed by the parents, the special education teacher, and a motor and/or language therapist. Teachers were certified in special education, while aides were not. Certified language and motor therapists provided individualized language and motor instruction to the children. These therapists also assisted teachers and paraprofessional aides with implementation of activities. Most parents in both treatment groups helped occasionally in the classroom, doing various tasks as directed by the teacher. However, the parents' primary involvement contact with the program was when the parents brought or picked the child up from school and during their IEP consultations.

Center-Based With Parent Involvement Intervention Program. Children in this group attended the same center-based program described above. Parents of children in this group participated in an education program based on the Parents Involved in Education (PIE) (Pezzino & Lauritzen, 1986) instruction package which was designed to improve the parents' skills in teaching their children and to help the parents be more competent partners in the intervention process. This type of parent involvement program was chosen because it was typical of the parent involvement programs most frequently described in the literature.

The PIE instructional modules were designed to provide parents with a systematic conceptual and hands-on experience in areas such as child development, observation and recording, targeting intervention behaviors, teaching processes, decision making, and communicating with professionals. The training format consisted of small group lecture, discussion, and demonstration. The curriculum included the following topics: (1) introduction and overview, (2) objective observation of child behavior, (3) defining and measuring behavior, (4) principles of behavior management, (5) analyzing behavior chains, (6) theories of child development, (7) testing and assessment, (8) criterion-referenced assessment, (9) developing learning objectives, (10) P.L. 94-142 and IEPs, (11) intervention strategies, (12) factors related to teaching success, (13) practice teaching session, (14) determining appropriate interventions, (15) communicating with professionals, (16) stress management, and (17), review, comments, concerns, and questions.

PIE instructional sessions were taught either by a social worker or the director of the intervention center. Average group size consisted of between 8 and 12 parents. Instruction sessions consisted of 15 ninety-minute sessions, held weekly over a period of four months. In addition to these sessions, parents were asked to practice the training activities at home with their children. They were asked to choose a target behavior for the child (such as a self-help or behavioral skill; e.g., compliance, dressing, etc.), implement an intervention program, and measure progress by comparing successful completion of the task before and after the intervention. A part of each PIE instructional session was designed to provide an opportunity for parents to form support networks and discuss challenges associated with parenting a child with a disability.

Treatment Verification

A number of procedures were implemented to verify that the intervention program occurred as planned. Child attendance at the center-based program was recorded daily and sent to EIRI on a monthly basis. As shown in Table 9.3, child attendance exceeded 65% for both the parent involvement and comparison groups. Attendance of parents at the PIE sessions was recorded weekly and these data were sent to EIRI on a monthly basis. The parents, on the average, attended 9 of the 15 sessions; one parent attended all 15 sessions and one parent attended none.

Parent ratings of the intervention services provided additional information about the nature of the treatment delivered to children. Parents rated seven aspects of the intervention program on a 1- (poor) to 4- (excellent) scale. Parents in both groups were similarly satisfied with the services with average ratings of almost 3.5 in each group. The only statistically significant ($p \leq .10$) differences[1] on parent ratings of services were that at Reassessment #1, soon after the PIE instruction was completed, parents in the center-based with parent involvement group were more satisfied with their opportunity to participate ($\underline{p} = .09$) and at Reassessment #2, the

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[1] *As discussed further in the Results section, alpha for all statistical tests was set at p ≤ .10 in order to increase statistical power and balance Type I and Type II errors.*

Table 9.3

Comparison of Treatment Verification Variables for Center-Based Only and Center-Based with Parent Involvement Group for 1986 Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p^{**} Value	ES^
REASSESSMENT #1								
. Child's school attendance (%)	68.8		28	65.6		27	.64	-.02
. Parent Attendance at PIE Instruction	0.0	(0.0)	28	8.7	(4.3)	28		
. Test of Parent Knowledge[\$]	14.0	(5.5)	28	18.0	(5.5)	28	.01	.73
. Parent ratings of educational services*								
Staff	3.4	(.5)	28	3.4	(.6)	27	.91	.00
Communication	3.3	(.6)	28	3.4	(.6)	27	.61	.17
Child's goals/activities	3.2	(.6)	28	3.3	(.6)	27	.61	.17
Opportunity to participate	3.3	(.7)	28	3.5	(.5)	27	.09	.29
Range of services	3.0	(.7)	28	3.2	(.7)	27	.23	.29
Program in general	3.2	(.6)	28	3.3	(.7)	27	.48	.17
Child's progress	3.3	(.5)	26	3.1	(.6)	23	.38	-.40
REASSESSMENT #2								
. Test of parent knowledge[\$]	15.0	(5.9)	20	19.1	(4.8)	17	.03	.69
. Parent rating of educational* services								
Staff	3.5	(.6)	19	3.5	(.7)	21	.81	.00
Communication	3.7	(.6)	19	3.4	(.8)	20	.08	-.50
Child's goals/activities	3.5	(.5)	19	3.4	(.5)	21	.78	-.20
Opportunity to Participate	3.6	(.6)	19	3.7	(.5)	21	.61	.17
Range of services	3.0	(.7)	19	3.2	(.8)	21	.43	.29
Program in general	3.5	(.5)	19	3.4	(.9)	21	.84	-.20
Child's progress	3.5	(.5)	20	3.5	(.8)	19	.86	.00
REASSESSMENT #4								
. Test of parent knowledge	14.8	(6.1)	27	17.4	(6.3)	24	.14	.43

[\$] All parents took a test based on the PIE curriculum that was taught to the parent involvement group. Higher scores indicate more correct answers.

[*] Data are based on Parent Satisfaction Questionnaire Scores (range 1-4). Higher scores indicate better ratings.

^ $$ES = \frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

center-based only group rated their ability to communicate with program staff higher (p = .08).

Interviews conducted with parents at the time of the second reassessment revealed that almost all were satisfied with the center-based services they received. Only one parent of the 40 interviewed reported leaving the center's intervention program because of dissatisfaction with the services. Several reported problems with transportation (6 parents) or scheduling of the child's classes (3 parents). The most frequently cited service mentioned as most helpful by these parents was speech therapy.

Parents who participated in the PIE program were asked specific questions about their classes. (Seventeen parents completed these questionnaires.) The majority (14) of these 17 parents found the center-based program more valuable than the PIE instruction. However, most reported less stress in their lives after the instruction (11) or no change in stress (2 parents). Fourteen of the 17 parents reported that they felt the PIE program positively influenced their interactions with their children, with these parents claiming greater objectivity and more effective use of reward and punishment. Fifteen of the 17 parents were satisfied with the parent involvement package and the information provided. Two parents did not report being satisfied. One was indifferent towards the program and attributed her indifference to her poor attendance, and the other parent did not feel the information was useful.

Treatment effects could be influenced by using more than one PIE instructor. Instructor effects have been previously noted in the parent involvement research literature (Hoover-Dempsey, Bassler, & Brissie, 1987). Therefore, an additional analysis was completed on the reassessment data which compared the effect of parenting group instructor on outcome measures for the parenting group. (Two instructors taught the parent workshops; one had one class of 9 parents while the other had two classes which also consisted of 9 parents each.) Table 9.4 presents these results. No statistically significant effect due to instructors was evident on child or family functioning measures. Thus, having different instructors for the PIE instruction did not appear to have affected the comparison of treatment intervention.

Table 9.4

Comparisons of Effect Due to Instructor at Reassessment #1 in the 1986 Parent Involvement Study

	Instructor A			Instructor B			p Value
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	
• Battelle Total (DQ)	56.45	14.3	9	66.02	14.5	18	.12
• CES-D (depression)	29.33	5.68	9	35.44	13.73	18	.22
• PSI--Child	114.67	18.90	9	122.61	17.07	18	.28
• PSI--Other	131.22	14.26	9	137.28	28.75	18	.47
• FACES--Adaptability	3.89	2.37	9	5.50	6.73	18	.37
• FACES--Cohesion	6.22	9.43	9	8.22	7.16	18	.54

A structured site visit during the initial year of the project was conducted by the research staff to make sure that the interventions were occurring as planned. The results of that site visit (a detailed report of which is available from EIRI) found that all the children participated in essentially the same center-based program, with the major difference being that the parents of the children in the center-based with parent involvement group received the additional parent involvement component and the parents of the children in the other group did not.

The treatment verification procedures described above were useful to decide whether the alternative intervention programs were delivered as planned. Knowing that the interventions differed in the ways intended increases the confidence that differences in outcomes, if found, were related to the differences in treatment and not to other factors. In a study such as this one it is also important to ascertain whether other historical factors occurred outside of the treatment which might have affected the results. A discussion of these follows.

Contextual Factors

The alternative early intervention programs under investigation were not the only factors which could have influenced the development of these children or the functioning of their families. Other factors, such as the health of the children, changes in the family's living situations, the families' resources, and other family stresses might influence child development and family functioning. Additionally, other intervention services purchased by the parents might affect the outcome scores. To the degree that these contextual factors are equal for children in both groups, differences in outcomes can be more confidently attributed to the differences between the treatments. However, if there are differences in these contextual factors for children between the groups and differences in outcome measures, we cannot be sure whether the differences in outcome measures are the result of differences in treatments or the differences in the contextual factors. Therefore, a concerted effort was made to monitor the effects of a number of contextual factors.

Annually, parents completed a demographic survey of their living situation and a child health survey. Key demographic factors that are subject to change are listed in Table 9.5. Throughout the reassessments, the center-based with parent involvement group included more families in which mother and father were present in the home and more children needing special education service than did center-based only group, echoing the initial assessment differences. Mean income of the groups increased over time, but remained comparable to each other across reassessments. Mothers in the center-based only group did tend to work more hours per week than did the mothers in the center-based with parent involvement group, but the difference was only statistically significantly different (p = .07) at Reassessment #4.

As part of the annual child health questionnaire, parents compared their children's general health to other children on a scale of "1" (poor health in comparison to others) to "3" (better health in comparison to others). The mean

Table 9.5

Comparison of Contextual Variables for Center-Based Only and Center-Based With Parent Involvement Groups for 1986 Utah Parent Involvement Study

Center-Based Program	Center-Based + PIE						p[**]	
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	Value	ES[^]
REASSESSMENT #1								
· **Child Health**	1.9	(.7)	28	1.9	(.7)	27	.68	.00
· **Demographics**								
Child living w/mother & father	.8	(.4)	26	1.0	(.0)	23	.03	.50
Mother's employment hrs/week	9.1	(14.1)	24	3.9	(8.6)	22	.13	-.37
Annual Income	$21,961	($12,689)	26	$22,956	($13,642)	23	.79	.08
Siblings receiving special education services	.1	(.3)	25	.6	(.8)	23	.01	1.67
· **Family Variables**								
Family Resources (FRS)[&]	112.4	(23.6)	28	111.3	(19.1)	28	.85	-.05
Family Life Events (FILE)[&]	10.7	(7.6)	28	12.1	(6.7)	28	.47	.18
· **Additional Services**								
Speech Therapy % receiving 1 hr/month or more	7.1		28	10.7		28	.65	.10
Physical/Occupational Therapy % receiving 1 hr/month or more	7.1		28	10.1		28	.65	.10
Daycare % received less than 5 hrs/week	100.0		28	89.0		28	.40	-.36
· **DDI Teacher Rating of Parents**[$]								
Attendance	2.6	(.8)	26	2.8	(.4)	24	.24	.25
Support	2.3	(1.0)	26	2.5	(.6)	24	.40	.20
Knowledge	2.2	(1.0)	26	2.6	(.5)	24	.07	.40
REASSESSMENT #2								
· **Child Health**	1.9	(.6)	19	2.0	(.6)	21	.75	.17
· **Demographics**								
Child living w/mother & father	.8	(.4)	21	1.0	(.0)	18	.03	.50
Mother's employment hrs/week	8.5	(15.6)	20	2.6	(6.4)	19	.13	-.38
Annual Income	$23,785	($15,895)	21	$25,631	($12,029)	19	.68	.12
Siblings receiving special education services	.2	(.5)	21	.8	(1.0)	19	.04	1.20
· **Family Variables**								
Family Resources (FRS)[&]	115.9	(22.7)	21	114.0	(19.2)	20	.77	-.08
REASSESSMENT #3								
· **Demographics**								
Child living w/mother & father	.8	(.4)	26	1.0	(1.0)	24	.10	.50
Mother's employment hrs/week	9.9	(15.5)	26	4.5	(8.5)	24	.13	-.35
Annual Income	$25,923	($15,052)	26	$25,458	($13,299)	24	.91	-.03
Siblings receiving special education services	.2	(.5)	26	.8	(1.1)	24	.02	1.20
· **Family Variables**								
Family Resources (FRS)[&]	117.5	(20.8)	26	117.8	(15.8)	24	.96	.01

(continued)

[^] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[**] The p value and ES are based on comparison of study status (i.e., in study, those who were tested at the reassessment versus out of study, those who were not tested at that reassessment). The sign of ES only indicates direction of difference; no value judgment is intended.

[$] Data are based on teacher rating of parents' attendance, support, and knowledge range (1-3). Higher scores indicate better ratings.

[&] Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for the FILE are based on raw scores. Lower scores represent less stress and are considered better.

[#] Annually, parents completed an additional services form which described other types of intervention or additional services the child and family received. At Reassessment #5, this was replaced with an interview.

Table 9.5 (continued)

Comparison of Contextual Variables for Center-Based Only and Center-Based with Parent Involvement Groups for 1986 Utah Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p[**] Value	ES[^]
REASSESSMENT #4								
. **Child Health**	2.0	(.5)	28	2.1	(.7)	24	.60	.20
. **Demographics**								
Child living w/mother & father	.8	(.4)	28	.8	(.4)	23	.79	.00
Mother's employment hrs/week	12.6	(17.6)	25	5.1	(9.3)	22	.07	-.43
Annual Income	$27,038	($16,617)	26	$26,478	($17,045)	23	.91	-.03
Siblings receiving special education services	.2	(.5)	28	.8	(1.1)	23	.01	1.20
. **Family Variables**								
Family Resources (FRS)[&]	118.5	(17.9)	28	115.4	(18.1)	24	.54	-.17
. **Additional Services**								
Speech Therapy % receiving 1 hr/ month or more	0		28	0		23	1.00	0
Physical/Occupational Therapy % receiving 1 hr/month or more	0		28	0		23	1.00	0
Daycare % received less than 5 hrs/week	100		28	100		23	1.00	0
REASSESSMENT #5								
. **Child Health**	2.0	(.5)	28	2.1	(.7)	25	.50	.20
. **Demographics**								
Child living w/mother & father	.8	(.4)	26	1.0	(.2)	25	.09	.50
Annual Income	$29,537	($13,975)	27	$32,160	($19,048)	25	.57	.19
Number of children receiving special education services[$]	1.1	(.4)	28	1.5	(.8)	25	.01	1.00
. **Family Variables**								
Family Resources (FRS)[&]	115.3	(20.0)	28	119.1	(16.8)	24	.46	.19
Family Stress (Holmes-Rahe)[+]	149.5	(94.1)	28	199.6	(152.4)	24	.15	.53
Family Negative Events[+] (Holmes-Rahe)	35.9	(48.2)	28	37.2	(51.5)	24	.92	.03

(continued)

[^] $$ES = \frac{\text{Center-Based + PIE } \bar{x} - \text{Center-based } \bar{x}}{\text{Center-Based SD}}$$

[**] The p value and ES are based on comparison of study status (i.e., in study, those who were tested at the reassessment versus out of study, those who were not tested at that reassessment). The sign of ES only indicates direction of difference; no value judgment is intended.

[&] Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for the FILE are based on raw scores. Lower scores represent less stress and are considered better.

[#] Annually, parents completed an additional services form which described other types of intervention or additional services the child and family received. At Reassessment #5, this was replaced with an interview.

[$] The form asking for children receiving special education services in the home was changed from number of siblings receiving special education services to number of children receiving special education services at this reassessment.

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Table 9.5 (continued)

Comparison of Contextual Variables for Center-Based Only and Center-Based with Parent Involvement Groups for 1986 Utah Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p^{**} Value	ES^
• **Additional Services**[#]								
Speech Therapy % receiving 1 hr/ month or more	3.6		28	20.0		25	.07	.45
Physical/Occupational Therapy % receiving 1 hr/month or more	17.9		28	16.7		25	.59	-.04
Total School Hours	1,140.1	(188.2)	28	1,156.8	(86.5)	25	.68	.09
REASSESSMENT #6								
• **Child Health**	2.1	(.6)	28	2.2	(.6)	25	.60	.17
• **Demographics**								
Child living w/mother & father	.9	(.3)	26	1.0	(.0)	23	.18	.33
Annual Income	$39,500	($23,004)	26	$38,400	($25,167)	25	.87	-.05
Number of children receiving special education services	1.1	(.5)	27	1.7	(.9)	25	.01	1.20
• **Family Variables**								
Family Resources (FRS)[&]	118.9	(18.9)	28	120.9	(17.0)	25	.69	.11
Family Stress (Holmes-Rahe)[+]	170.8	(82.1)	28	165.4	(119.3)	25	.85	-.07
Family Negative Events[+] (Holmes-Rahe)	33.8	(48.1)	28	33.0	(41.1)	25	.95	-.02
• **Additional Services**[#]								
Speech Therapy % receiving 1 hr/ month or more	0		28	0		25	1.00	.00
Physical/Occupational Therapy % receiving 1 hr/month or more	17.9		28	12.0		25	.56	-.13
Total School Hours	1,117.3	(133.4)	28	1,076.2	(133.4)	25	.17	.31

^ $$ES = \frac{\text{Center-Based + PIE } \bar{x} - \text{Center-based } \bar{x}}{\text{Center-Based SD}}$$

** The p value and ES are based on comparison of study status (i.e., in study, those who were tested at the reassessment versus out of study, those who were not tested at that reassessment). The sign of ES only indicates direction of difference; no value judgment is intended.

$ Data are based on teacher rating of parents' attendance, support, and knowledge range (1-3). Higher scores indicate better ratings.

& Analyses for the FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. Analyses for FILE are based on raw scores. Lower scores represent less stress and are considered better.

Annually, parents completed an additional services form which described other types of intervention or additional services the child and family received. The number of total school hours attended was added to this list when most of the children reached school age. At Reassessment #5, this was replaced with an interview.

+ Analyses for the Holmes-Rahe are based on raw scores. For both family stress and negative events lower scores represent less stress and are considered better.

scores and standard deviations across reassessments indicate that the health of the children in the two groups was very similar and that most of the children had average health when compared to other children.

Perceptions concerning family resources was obtained annually via the Family Resource Scale (FRS). (A more complete description of this and other scales used is presented later.) Other stressors which may have affected child or family functioning were measured at Reassessment #1 by the Family Inventory of Life Events

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(FILE) and at Reassessments #5 and #6, by the Holmes-Rahe Major Life Events Scale. Scores for the two groups remained very comparable across the reassessments for both family resources and other stresses.

Other intervention obtained by the parent for the child might influence the child's development. Parents reported additional services their child received during the previous year at Reassessments #1, #4, #5, and #6. These speech, physical, and occupational therapies were in addition to any that were part of their school program. More than 75% of the families did not report any additional therapies, and at no reassessment did one group receive statistically significantly more additional services than the other.

The degree to which the parent is committed to, supportive of, and knowledgeable about the child's intervention program might also influence the child's development. A description of quality of parent involvement was gathered at Reassessment #1 from the intervener who worked most closely with the child's mother. The data obtained was the intervener's rating (low[1], average[2], high[3]) of the parent's attendance, knowledge, and support. The teachers rated the parents in the parent involvement group statistically significantly higher (p = .07) on knowledge, which is what would be expected given the additional instruction parents in this group were receiving. The teachers rated the parents in the two groups similarly on attendance and support. While the mean ratings for these variables tended to be high (2.62 for attendance, 2.40 for knowledge, and 2.42 for support), nearly half the sample ranked as low or average on one or more of these categories, indicating that interveners were discriminating in the ratings they applied. These intervener ratings of the parents are typical of the situations experienced by many early intervention professionals who work with parents (Lochman & Brown, 1980).

In sum, except for "number of parents in the home" and "other siblings needing special education services," consistent statistically significant differences of contextual factors between the two groups were not found. Thus, the influence of these contextual factors on the outcome measures of child development and family functioning would appear to be comparable for both the center-based only and the center-based with parent involvement groups.

Cost of Alternate Programs

It is important to determine the cost of adding any type of a parent involvement component to an already established center-based program. Should costs be high and relative benefits be low, money used to establish a parent program might be better spent elsewhere. Haskins and Adams (1982) point out that there is a great need for cost analysis in the area of parent education to provide evidence that such programs will justify their costs by increasing the productivity of parents, their children, or both, and/or reduce the necessity for larger investments in treatment programs at some later date. This study has addressed these issues in part, and will provide more conclusive answers as it follows these children through their school years.

The cost of the center-based only program and the center-based with parent involvement program as described above was determined using the ingredients approach advocated by Levin (1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs. It includes costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, transportation, materials and supplies, miscellaneous, and contributed resources. The cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each program. Table 9.6 shows all costs after they were adjusted for inflation to 1990 dollars.

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to each program. Occupancy charges included the annual rent for the two facilities in which the program was

Table 9.6

Cost Per Child for the 1986 Utah Parent Involvement Study (1990 Dollars)

Resources	Center-Based Program (n = 174)	Center-Based + PIE (n = 29)
Agency Resources		
Direct Service	$3,153	$3,334
Administration	608	640
Occupancy	694	694
Equipment	89	89
Transportation		
Children	10	10
Staff	7	7
Materials/Supplies	51	58
Miscellaneous	30	30
SUBTOTAL	**$4,642***	**$4,862***
Contributed Resources		
Volunteer time	25	25
Parent time	416	1,208
Parent Transportation	1,306	1,383
Miscellaneous	2	2
Subtotal	**$1,749***	**$2,618***
Total	***$6,391****	***$7,480****

* *Totals may not add up due to rounding errors.*

housed, and all utilities, insurance, and maintenance costs. Equipment costs were based on estimates of the market replacement value of all equipment owned by the center, annualized to account for interest and depreciation. In addition, the cost of rental and maintenance of other equipment not owned by the center was determined. Transportation costs were paid by the center for staff home visits, workshop attendance, and errands as well as the costs of bringing low-income children into the center. Transportation costs for all other children were assumed by their parents and are included under "contributed resources." The cost for materials and supplies and miscellaneous included the annual expense to the program for all consumable items and miscellaneous expenses incurred by each program.

Contributed resources included the value of volunteer and parent time. Community members contributed 426 hours during the year to the program. Based on actual attendance data, the average parent in the PIE group spent approximately 13 hours in instructional sessions. Assuming that parents followed PIE curriculum requirements, parents also spent about 67 hours working at home with their child. In addition, parents in both groups provided transportation for their children. The cost of child transportation was estimated based on information provided by parents via telephone interview. All volunteer time in the program was assigned the opportunity cost of $9 per hour. This amount was based on the "median usual weekly earnings for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989). Finally, contributed miscellaneous resources included the market value of a computer donated to the program.

Table 9.6 presents results which demonstrate that the addition of this type of parent involvement is fairly inexpensive. On the average, the addition of parent instruction to the center-based program only costs about $180 more per child in direct costs to the center. This is mostly due to increased personnel costs, although a small amount goes to supplies. However, when the value of contributed resources is added in, this difference is approximately $1,000, reflecting the addition of the parents' time. Although the addition of this type of a parent involvement program is fairly inexpensive in actual dollars for an already-established center-based program, there is a substantial cost to participating parent in terms of their time. The question of the relative effectiveness of the parent involvement will be addressed in the results section.

Data Collection

Data collection included the selection of measures; the recruitment, training, and monitoring of diagnosticians, and the administration of measures at the initial assessment and the subsequent reassessments. The multiple measures used to obtain data on the children and their families and the schedule for administration assessments are listed in Table 9.7. Descriptions of the measures are presented in Table 9.8. The battery of assessments selected were those that previous research had suggested would likely be affected by intervention. All of the measures have been used widely in early intervention research, have adequate documentation regarding reliability and validity, and are appropriate for children with disabilities of the ages included in this study. More extensive discussion of the characteristics and psychometric adequacy of these measures is available in White (1986).

Table 9.7

Schedule of Administration of Measures for Utah 1986 Parent Involvement Study

	Assessment	Reassessment #1	Reassessment #2	Reassessment #3	Reassessment #4	Reassessment #5	Reassessment #6
CHILD MEASURES							
Battelle Developmental Inventory	X	X	X	X	X		
Developmental SPECS					X	X	
Minnesota Child Development Inventory		X					
Child Health		X	X		X	X	X
Woodcock-Johnson Tests of Achievement--Revised						X	X
The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children						X	X
Scales of Independent Behavior						X	X
Social Skills Rating System (Parent Form)						X	X
Social Skills Rating System (Teacher Form)						X	X
FAMILY MEASURES							
Parent Stress Index	X	X	X	X	X		X
Family Support Scale	X	X	X	X	X	X	X
Family Resource Scale	X	X	X	X	X	X	X
Family Inventory of Life Events and Changes	X	X					
Family Adaptation and Cohesion Scale	X	X	X	X	X		
CES-D Depression Scale		X					
Child Improvement Questionnaire--Revised		X	X				
Peabody Picture Vocabulary Test	X*						
Parent-Child Interaction		X	X		X		
Public School Teacher Evaluation			X		X	X	X
Additional Services		X			X	X	X
Parent Self-Awareness Scale						X	X
Major Life Events						X	X
Comprehensive Evaluation of Family Functioning						X	
Family APGAR						X	X
Family Functioning Style Scale							X

* Given at Reassessment #1, but actually a part of the assessment.

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Table 9.8

Description of Tests Administered for Utah 1986 Parent Involvement Study

MEASURES	DESCRIPTION
CHILD MEASURES	
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses Personal/Social, Adaptive, Motor, Communication, and Cognitive Skills, and provides a total score.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: Communication, Sensorimotor, Physical, Self-Regulation, Cognition, and Self-Social.
Minnesota Child Development Inventory (MCDI) (Ireton & Thwing, 1974)	Assesses mother's perception of child development in eight areas: General Development, Gross Motor, Fine Motor, Expressive Language, Comprehension-Conceptual, Situation Comprehension, Self Help, and Personal-Social
Child Health (E.I.R.I.)	Assesses the parents evaluation of the child's health during the past year, including general health, illnesses, hospitalization, etc.
Woodcock-Johnson Tests of Achievement--Revised (WJ-R) (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of six aspects of scholastic achievement: Letter-Word Identification, Applied Problems, Dictation, Science, Social Studies, and Humanities. Two cumulative scores are provided, a broad knowledge score and a skills knowledge score. Child is the respondent.
The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1983)	A pictorial scale of perceived competence and social acceptance for young children. Four domains are assessed: cognitive competence, physical competence, maternal acceptance, and peer acceptance.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1985)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: Motor Skills, Social and Communication Skills, Personal Living Skills, and Community Living Skills. Parent is interviewed for information.
Social Skills Rating System (Gresham & Elliot, 1990)	A norm referenced measure of the teacher or parent's estimate of the child's social skills such as: control, assertion, and self-control. Ratings of problem behaviors (externalizing, internalizing, and hyperactivity) and academic competence are also assessed.
FAMILY MEASURES	
Parenting Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors. The original scale was shortened by Abidin in 1990 to 36 items. The three domains of this short form (PSI/SF) are parent distress, parent-child interaction, and difficult child.
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: Intra-Family, Martial, Pregnancy and Childbearing, Finance and Business, Work-Family Transitions, Illness and Family "Care," Losses, Transitions "In and Out," and Legal.

(continued)

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Table 9.8 (continued)

Description of Tests Administered for Utah 1986 Parent Involvement Study

MEASURES	DESCRIPTION
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations.
CES-D Depression Scale (Radloff, 1977)	This scale is a short self-report test designed to measure depression-symptomatology on the general population.
Child Improvement Questionnaire--Revised (Devellis, Revicki, & Bristol, 1985)	The questionnaire has been adapted from the Child Improvement Locus of Control (CILC). The CILC assesses parental perceptions of factors that affect the progress of their child with disabilities. Factors assessed are: chance, efforts by professionals, the child's efforts, parent efforts, and divine intervention.
Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 1981)	Measures the receptive vocabulary of the mother. The score correlates highly with the mother's IQ.
Test of Parent Knowledge (E.I.R.I.)	Assesses parent's knowledge of PIE curriculum. Includes 30 multiple-choice questions.
Parent/Child Interaction (E.I.R.I.)	15 to 20 minute videotape of parent-child interaction following a set protocol devised by EIRI.
Additional Services (E.I.R.I.)	Provides data on services the child and family have received during the past year outside the study (e.g., Schooling, Early Intervention, Speech Therapy, Physical and Occupational Therapy, Tutoring).
Parent Self-Awareness Scale (PSAS) (Snyder, Weeldreyer, Dunst, & Cooper, 1985)	The PSAS is a 20-item questionnaire that measures the parent's perceived level of personal capabilities, decision-making capabilities, and informational capabilities.
Major Life Events Scale (Holmes & Rahe, 1967)	Assesses parental stress by assigning numerical values to various positive and negative life events occurring within the past year. A separate score of the occurrence of major negative events is also provided.
Comprehensive Evaluation of Family Functioning (CEFF) (McLinden, 1990)	The CEFF examines areas in which a family of a child with special needs may be affected: time demands, acceptance, coping, social relationships, financial demands, well-being, and sibling relationships. It is a parent self-report measure.
Family APGAR (Smilkstein, 1978)	The family APGAR assesses five functional components of family life by presenting five statements to which the parent responds using a Likert-type format. Family functions include: Adaptability, Partnership, Growth, Application, and Resolve.
Family Functioning Style Scale (FFSS) (Deal, Trivette, & Dunst, 1988)	The scale is a 26-item scale that assesses the extent to which the person (i.e. mother) believes that their family is characterized by different strengths and capabilities.

Recruitment, training, and monitoring of diagnosticians. With the exception of one BDI tester, this project used the same diagnosticians for the initial assessment, Reassessment #1, and Reassessment #2. All of the diagnosticians had Master's degrees and extensive experience assessing infants and children with disabilities. In addition, two of the three testers were enrolled in special education doctoral

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programs. All were trained through a lengthy process which involved approximately 4 hours of independent study, 8 hours of group training, and a minimum of 3 practice administrations. To be certified, a diagnostician had to demonstrate administration and scoring competence to the institute assessment coordinator. Once certified, 10% of all administrations were shadow scored for interrater agreement, and all protocols were checked by clerks for adherence to scoring conventions.

At Reassessments #3, #4, #5, and #6, new testers were trained. All were graduate students or professionals in special education or language therapy; all were experienced testers; all had worked extensively with children. At Reassessment #5 and #6, all diagnosticians (including those who had been previously certified and those in the process of certifying) attended a workshop reviewing procedures, scoring, etc.

Although the diagnosticians were aware that research was being conducted, they were "blind" to the specific details, hypotheses, and group membership of participants in the study. Shadow scoring, as outlined above, was conducted on 10% of BDI or WJ-R and SIB administrations. Average interrater reliability scores always exceeded 90%, with the Reassessment #6 interrater reliability exceeding 96%. In addition to the shadow scoring, each scored test protocol was reviewed by a clerk. Quality control checklist protocols were prepared for and sent to each tester. On the checklist, each protocol the tester had administered was listed, and any errors (e.g., basal, ceiling, addition) were noted. No protocols were problematic due to administration or scoring errors.

Assessment. The initial assessments took place in late October and early November of 1986. Parents of each child participating in the study completed an informed consent form and were interviewed concerning demographic information. In the first of two assessment sessions, children were administered the Battelle Developmental Inventory (BDI). Testing occurred at the center. In a second assessment session, which usually took place within two weeks of the BDI test session, parents (usually the mother) completed the following family measures: the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Inventory of Life Events and Changes, and the Family Adaptability and Cohesion Scales. Information pertaining to the reliability and validity of these measures may be found in the first annual report (White & Casto, 1985). Each of these two sessions lasted approximately 1½ hours. Parents were paid a $20 incentive after both assessing sessions were completed.

Reassessment #1. The first reassessment was completed 7.5 months later during the last two weeks of May and the first week of June 1987. The reassessment battery took three test sessions to administer. The reassessment battery consisted of the same battery of tests and surveys as the initial assessment battery as well as some additional measures. For mothers, additional tests and surveys included the CES-D Depression Scale, a survey of child health, the Child Improvement-Questionnaire--Revised (a measure of locus of control), a test of knowledge regarding PIE curriculum, a satisfaction with educational services questionnaire, and the Peabody Picture Vocabulary Test. (Although the PPVT was given at Reassessment #1, it was included with the initial assessment measures, reasoning that attending PIE instruction would not affect the scores.) Mothers also completed the Minnesota Child Development Inventory (MCDI), an additional measure of the child's developmental level as perceived by the mother. The reassessment BDI and PPVT were administered by the trained diagnosticians. Parents were paid a $40 incentive for completing the reassessment battery. Additionally, mother/child interaction was videotaped for approximately 16 to 20 minutes using a standardized protocol, and mothers were paid $10 for the videotaping session.

Reassessment #2. A second reassessment was conducted with both treatment groups in June, 1988. No monitoring of parental implementation of training principles took place between the first and second reassessment. Parents were contacted via telephone, and appointments were made for both parents and their child(ren) to complete the core measures. The children were administered the BDI while parents filled out various family measures. In addition to family measures, parents in both treatment groups again completed the questionnaire assessing the parents' satisfaction with the preschool educational services and a test of knowledge regarding PIE curriculum. All parents were interviewed and were given the opportunity to comment on services received at the center. The parents who had received the PIE instruction were asked to discuss their attitudes, knowledge, and satisfaction with the instructional program. They were also asked to discuss how their parenting techniques had changed as a result of the PIE, as well as how they handled stressful parenting. Parent-child interaction was again videotaped. After the completion of both the BDI and parental measures and interviews, parents were compensated $30 for their time.

For those few children (12) who were already in public school, permission was obtained to contact the teachers of study participants. These teachers were asked to complete a questionnaire designed to ascertain the teachers' impressions of the parent's involvement with the child's program and progress in comparison with other parents. This questionnaire also gathered information on the child's classification, school attendance, classroom placement, tests administered, teacher certificates held, and teacher's recommendation for the child's future placement. As an incentive for teachers to participate, two posters appropriate for classroom use were mailed with the questionnaire. This questionnaire had a 100% return rate.

Reassessment #3. A third reassessment was taken during the summer of 1989. Procedures for this reassessment were similar to that of the second reassessment. Parents were contacted via telephone and appointments made for parents and their children to complete the core measures. Assessments were conducted at a local community college and a nearby preschool. For some of the subjects, the assessments were completed in their homes. The children were administered the BDI while parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Adaptability and Cohesion Scales, and a demographic survey. Testing sessions lasted approximately two hours and parents were paid $35 for their participation.

Reassessment #4. The procedures for the testing at Reassessment #4 remained the same. The parents were contacted by letter in January, 1990, informing them of the schedule for testing and encouraging their participation. Permission to contact the school teachers, and the name of the teacher and school were also requested. Most of the testing took place at a special education center in the Salt Lake City area with a few children (primarily those living out of state) being tested in their homes. Most of the testing was completed in April with some being done in May, June, and July.

A majority of the measures used were the same as were used previously. Videotaping of parent-child interaction was also completed, using the standardized protocol that was used at Reassessments #1 and #2. The length of the taping was increased to 20 minutes and toys appropriate for older children were included. The testing session lasted approximately 2½ hours and parents were paid $50 for the family's participation.

The public school teachers completed measures of child development, using the Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1989). This measure asks the teacher to rate the child's development using Likert-type scales in 19 areas. On these scales a score of 5 signifies that the child's behavior is typical of behavior of most of the children of the same age, and a score of 1 signifies severe problems or very atypical development in that area. The teachers also completed a questionnaire describing the children's present educational program and evaluating the parents' participation in the children's education. Teachers were again sent classroom posters to thank them for their participation. At this time, the children were attending 32 different elementary schools. It is highly unlikely that the present public school teachers would be aware of the parent involvement component of the intervention program which had transpired over three years before.

Reassessment #5. The procedures for testing at Reassessment #5, including the contacting, scheduling, and testing location, length of testing and payment were the same as those at Reassessment #4. Most of the testing was completed in April with some being done in March and May.

Many of the measures were changed for Reassessment #5. The Woodcock-Johnson Test of Achievement--Revised (WJ-R) and the Scale of Independent Behaviors (SIB) replaced the Battelle Developmental Inventory (BDI) due to the age of the children. A measure of child self-concept, the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter & Pike, 1983) was completed by the children. The Pictorial Scale of Perceived Competence and Social Acceptance provides two measures of perceived competence (cognitive and physical) and two measures of perceived social acceptance (by peers and by mother). This measure was too difficult for some of the subjects; hence 41 subjects completed the measure. A measure of child social skills as perceived by mother and teacher (Social Skills Rating System (SSRS), Gresham & Elliot, 1990) was also used. The family parenting stress measures (PSI) and family functioning measure (FACES III) were not used this year. A new measure of family functioning for families of children with special needs (Comprehensive Evaluation of Family Functioning (CEFF), McLinden, 1990), a measure of general family functioning (Family APGAR, Smilkstein, 1978), a measure of family stress and readjustment (Major Life Events Scale) (Holmes & Rahe, 1967), and a measure of parent self-awareness (Parent Self Awareness Scale PSAS) (Snyder et al., 1985) were also used. The testing session lasted approximately 1½ to 2 hours. Parents were paid $50 for participating.

The present school teachers were again asked to complete the Developmental SPECS, a measure of child development, along with the social skills rating scale, and a questionnaire describing the child's present educational program and evaluating the parents' participation in the children's education. Gift certificates to a school supply store were sent to the teachers to thank them.

Reassessment #6. The procedures for this reassessment were the same as those for Reassessment #5. Most of the testing was completed at the special education center that was used for Reassessments #4 and #5. Some testing was completed in homes in order to accommodate parent schedules or for those living outside of the Salt Lake City area. Most of the testing was completed in March. Fifty-three children and their parents participated in the testing. School teachers were again asked to complete measures. The battery of assessments given was essentially the same as it was at Reassessment #5. The Comprehension Evaluation of Family Functioning (CEFF) (McLinden, 1990) and the Developmental SPECS (Bagnato & Neisworth, 1990) were not given. The Parenting Stress Index Short Form (Abidin, 1990) was given to measure parenting stress. A measure of family strengths, the Family Functioning Style Scale (FFSS) (Deal, Trivette, & Dunst, 1988) was added to the battery of assessments. Parents were again paid $50 for their participation and teachers were sent gift certificates redeemable at a school supply store or $10 for their participation.

Results and Discussion

The primary question that these analyses sought to answer is: What are the immediate and long-term effects on the functioning of participating children and families of adding a particular type of parent involvement component to an existing center-based early intervention program? Additionally, does the degree of parent participation affect the children and families' functioning?

The first question is addressed by comparing the two treatment groups, the center-based only group and the center-based with parent involvement group, on child outcome measures first, and then on family functioning measures. The second question is addressed by comparing the group of parents in the center-based with parent involvement group who attended 11 or more of the PIE sessions, with the center-based only group. This will be called the participation comparison. For each question, child outcomes will be discussed first, followed by the family functioning outcomes.

The degree to which these questions can be answered definitively depends in part on whether the groups were comparable at the initial assessment. This issue will be addressed first, followed by the results of the analyses concerning differences between the groups at the various reassessments.

Comparability of Groups on Initial Assessment Measures

As was noted in the section on demographic characteristics, the two groups were very comparable on family demographic characteristics (refer back to Table 9.1); the groups were different only on the number of children living with both parents and the number of families having other children with disabilities.

The two groups were also very comparable on the initial assessment measures. As can be seen in Table 9.9, there were no statistically significant differences on any child development or family measures. The children had an average developmental quotient of 58 (age equivalent score ÷ chronological age x 100), which would be considered moderately delayed. The parents were experiencing significant child-related stress (measured by the PSI) with average child-related stress ranking at the 88th percentile (compared to PSI norms). The parents also felt they had experienced a fair number of disrupting events based on national norms.

Selection of Covariates

The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. (Analyses other than analyses of covariance are described as such in the text and/or table.) Treatment group served

Table 9.9

Comparison on Assessment Measures of Center-Based and Parent Involvement Groups in the 1986 Utah Parent Involvement Study

	Center-Based Program				Center-Based + PIE					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES[^]
• Battelle Developmental Inventory (BDI)[*]										
Personal Social	85.6	(27.7)		28	85.3	(30.6)		28	.97	-.01
Adaptive Behavior	54.0	(14.2)		28	55.9	(16.5)		28	.64	.13
Motor	69.8	(22.7)		28	75.4	(24.4)		28	.38	.25
Communication	37.8	(13.7)		28	39.4	(15.3)		28	.68	.12
Cognitive	30.0	(8.9)		28	31.8	(12.7)		28	.55	.20
TOTAL	277.2	(73.1)		28	287.8	(85.7)		28	.62	.15
• Parenting Stress Index[♦] (PSI) Percentile Rank										
Child Related Domain (range 47 to 235)	122.7	(23.5)	90	28	117.3	(17.7)	86	27	.34	.23
Other Related Domain (range 54 to 270)	131.7	(30.5)	70	28	137.6	(20.1)	76	27	.40	-.19
• Family Adaptation and Cohesion Evaluation Scales (FACES)										
Adaptability (range 0 to 50)	24.5	(5.8)		28	25.7	(6.0)		28	.46	.21
Cohesion (range 0 to 50)	37.9	(8.1)		28	39.4	(4.5)		28	.38	.19
• Family Resource Scale (FRS)[$]	114.5	(18.2)	42	28	112.9	(18.0)	40	27	.74	-.09
• Family Support Scale (FSS)[$]	28.5	(11.4)	52	26	29.2	(10.2)	59	26	.80	.06
• Family Index of Life Events[♦] (FILE)	11.4	(6.8)	31	28	12.5	(6.9)	30	27	.56	-.16

[*] Statistical analyses for the BDI were conducted using raw scores and these are presented in the table.

[$] Analyses for the FSS and FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all assessments collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

[♦] Analysis for PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, high percentiles on the FILE represent fewer stressful events.

[^] $$ES = \frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. Even though subjects were randomly assigned to groups, analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In

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either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis.

All pretest assessments and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or assessment variables for which there were the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Although sample sizes for this study are as large or larger than previous early intervention studies with these types of children, the statistical power of the analysis is still a concern. By setting the alpha level for all tests of statistical significance at $p \leq .10$, and by using analysis of covariance procedures, the statistical power of the analyses was substantially increased. According to Hopkins (1973) and Cohen (1977), in those cases where a covariate or set of covariates could be found which correlated at least .60 with the dependent variable in question (which was almost always the case in these analyses), and with alpha set at $p \leq .10$, the statistical power was approximately 81% for finding moderately sized differences (defined by Cohen as differences of a half a standard deviation).

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Reassessment #1 group comparisons. The results of the BDI and the Minnesota Child Development Inventory (MCDI) at Reassessment #1 (approximately two months after the PIE instruction was completed) demonstrate that the two groups were developmentally very comparable. Only one statistically significant difference was found out of 14 scores (refer to Table 9.10). On the personal-social domain of the BDI, the children in the center-based with parent involvement group scored higher than the children in the center-based only group. Other than this one difference (which may have been a chance occurrence), there is no clear cut developmental advantage for either group.

Table 9.10

Comparison of Reassessment Measures of Child Functioning for Subjects in Center-Based Only and Center-Based with Parent Involvement Groups (Reassessments #1-#6) in the 1986 Utah Parent Involvement Study

Variable	Covariates$	Center-based only				Center-based + PIE				ANCOVA F	p Value	ES^
		$\bar{X}$	(SD)	Adj.$\bar{X}$#	n	$\bar{X}$	(SD)	Adj.$\bar{X}$#	n			
REASSESSMENT #1												
• **Age in months at Reassessment #1@**		50.0	(10.5)		28	48.6	(10.6)		28	.24	.62	-.13
• **Battelle Developmental Inventory (BDI) Raw Scores for:***												
Personal-Social	1,5,7	87.3	(28.0)	88.4	28	98.5	(29.8)	97.4	28	4.09	.05	.32
Adaptive Behavior	2,3,7	56.7	(15.4)	58.1	28	61.6	(17.2)	60.2	28	.89	.35	.14
Motor	3,7	77.4	(23.9)	80.7	28	83.1	(28.5)	79.8	28	.15	.70	-.04
Communication	4,5,7	44.0	(16.4)	45.7	28	46.0	(19.6)	44.3	27	.52	.47	-.09
Cognitive	4,5,7	34.3	(13.7)	35.4	28	38.3	(15.8)	37.2	28	.78	.38	.13
Total	6,7	298.9	(81.6)	306.6	28	327.3	(92.3)	319.7	28	2.27	.14	.16
• **MCDI**												
General Development	6	76.0	(22.9)	77.4	28	78.8	(23.9)	77.4	28	.00	.99	.00
Gross Motor	3	21.6	(6.4)	22.3	28	22.3	(7.2)	21.6	28	.41	.52	-.11
Fine Motor	2, 3	29.9	(6.4)	30.4	28	30.4	(6.7)	29.9	28	.15	.70	-.08
Expressive Language	4	36.9	(10.7)	37.4	28	37.0	(11.4)	36.5	28	.27	.60	.08
Comprehension Conceptual	5	29.8	(13.3)	30.7	28	32.0	(15.0)	31.0	28	.02	.90	.02
Situation Conceptual	6	27.6	(7.4)	28.0	28	27.5	(8.7)	27.1	28	.40	.53	-.12
Self-Help	2	20.8	(7.3)	21.2	28	22.1	(7.2)	21.7	28	.22	.64	.07
Personal-Social	1	22.4	(5.8)	22.4	28	23.5	(6.2)	23.5	28	1.15	.29	.19
REASSESSMENT #2												
• **Age in months at Reassessment #2@**		61.4	(11.9)		20	60.6	(11.6)		20	.05	.83	-.07
• **Battelle Developmental Inventory (BDI) Raw Scores for:***												
Personal-Social	4,5,7	101.7	(23.9)	103.9	20	111.4	(19.1)	109.2	20	1.58	.22	.22
Adaptive Behavior	2,3,7	67.4	(15.7)	69.0	20	72.6	(12.1)	71.0	20	.46	.50	.13
Motor	3,7	92.4	(20.5)	95.9	20	102.5	(24.3)	99.0	20	.85	.36	.15
Communication	4,5,7	50.4	(17.7)	52.3	20	56.1	(17.1)	54.1	20	.26	.61	.10
Cognitive	4,5,7	41.4	(16.2)	43.5	20	51.0	(18.0)	48.9	20	2.78	.10	.33
Total	6,7	353.2	(76.5)	362.1	20	394.5	(72.5)	385.5	20	4.08	.05	.31

(continued)

Covariance adjusted means

* Statistical analyses for the BDI were conducted using raw scores and these are presented in the table.

@ Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

$ Covariates included BDI pretest scores (1 = Personal-Social, 2 = Adaptive Behavior, 3 = Motor, 4 = Communication, 5 = Cognitive, 6 = Total) and other pretest variables (7 = Child's Age, 8 = Number of Siblings in the Home)

^
$$ES = \frac{\text{Center-Based + PIE Adj.}\bar{X} - \text{Center-based Adj.}\bar{X}}{\text{Center-Based SD}}$$

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Table 9.10 (continued)

Comparison of Reassessment Measures of Child Functioning for Subjects in Center-Based Only and Center-Based with Parent Involvement Groups (Reassessments #1 - #6) in the 1986 Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
REASSESSMENT #3												
• **Age in months at Reassessment #3**[@]		74.1	(9.6)		26	72.6	(11.2)		25	.25	.62	-.16
• **Battelle Developmental Inventory (BDI) Raw Scores for:**[*]												
Personal-Social	1,5	113.8	(34.7)	115.6	26	128.3	(23.3)	126.5	25	2.82	.10	.31
Adaptive Behavior	2,3	73.3	(17.8)	76.1	26	83.4	(15.2)	80.6	25	1.85	.18	.25
Motor	3	93.2	(28.1)	98.9	26	107.6	(27.5)	101.9	25	.57	.45	.11
Communication	4,5	56.9	(22.6)	58.9	26	64.6	(21.6)	62.6	25	.68	.41	.16
Cognitive	4,5	45.2	(17.2)	47.3	26	59.4	(22.7)	57.4	25	6.35	.02	.59
Total	6	382.4	(99.1)	393.7	26	443.0	(92.0)	431.7	25	3.87	.06	.38
REASSESSMENT #4												
• **Child Age at Reassessment #4**[@]		84.3	(10.9)		28	83.0	(11.6)		24	.19	.67	-.12
• **Battelle Developmental Inventory (BDI) Raw Scores for:**[*]												
Personal-Social	1,4	128.8	(33.9)	129.2	28	144.1	(22.8)	143.7	24	5.13	.03	.43
Adaptive Behavior	2,3	79.1	(21.6)	81.3	28	89.8	(17.5)	87.7	24	2.31	.14	.30
Motor	3	101.4	(31.8)	106.1	28	116.3	(32.9)	111.6	24	1.28	.26	.17
Communication	4,5	64.4	(23.9)	66.8	28	75.0	(24.5)	72.5	24	1.70	.20	.24
Cognitive	4,5	59.8	(26.3)	62.3	28	72.1	(25.8)	69.6	24	2.03	.16	.28
Total	6	433.5	(114.6)	443.2	28	497.3	(105.5)	487.7	24	4.11	.05	.39
• **Teacher's Developmental**[♦] **SPECS**												
Communication	4	6.8	(1.7)	6.9	25	6.4	(1.9)	6.3	22	1.47	.23	-.35
Sensorimotor	3	14.0	(3.7)	14.3	25	14.8	(3.0)	14.5	22	.07	.80	.05
Physical		11.6	(1.7)	11.6	25	12.2	(1.7)	12.2	22	1.36	.25	.35
Self-Regulation	6	13.8	(3.6)	13.9	25	16.0	(3.3)	15.9	22	4.27	.05	.56
Cognition	5	5.6	(2.3)	5.7	25	6.3	(2.3)	6.1	22	.52	.48	.17
Self/Social	6	12.7	(3.7)	12.8	25	14.6	(3.2)	14.5	22	3.02	.09	.46
• **School Placement**[▾]												
% not eligible for special education		4.0			25	13.6			22		.27	.28
% time in typical classroom		26.3			26	37.3			21	1.00	.32	.22
% time in full-time special education		73.1			26	56.8			21	1.90	.18	.31

(continued)

[#] Covariance adjusted means

[*] Statistical analyses for the BDI were conducted using raw scores and these are presented in the table.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[$] Covariates included BDI pretest scores (1 = Personal-Social, 2 = Adaptive Behavior, 3 = Motor, 4 = Communication, 5 = Cognitive, 6 = Total) and other pretest variables (7 = Child's Age, 8 = Number of Siblings in the Home)

[^]
$$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[♦] Each of the SPECS scores include a different number of items, each of which are ranked by the teacher on a Likert-type scale of 1 to 5. A score of 5 represents development in that area that is typical of peers and a score of 1 represents development that is atypical or problematic. Therefore, the optimal developmental score for communication is 10; sensorimotor, 20; physical, 15; self-regulation, 20; cognition, 10; self-social, 20.

[▾] Scores in this category represent percentages related to child's present educational placement. The questions for Reassessments #4 and #5 differed slightly from those used at Reassessment #6.

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Table 9.10 (continued)

Comparison of Reassessment Measures of Child Functioning for Subjects in Center-Based Only and Center-Based with Parent Involvement Groups (Reassessments #1 - #6) in the Utah Parent Involvement Study

Variable	Covariates$	Center-based only				Center-based + PIE				ANCOVA F	p Value	ES^
		$\bar{x}$	(SD)	Adj.$\bar{x}$#	n	$\bar{x}$	(SD)	Adj.$\bar{x}$#	n			
REASSESSMENT #5												
• **Age in months at Reassessment #5@**		98.0	(10.5)		28	96.6	(11.2)		25	.22	.64	-.13
• **Woodcock-Johnson Revised Achievement Raw Scores for:**♣												
Broad Knowledge Total	5	441.2	(29.7)	443.5	28	455.0	(26.1)	452.7	25	2.02	.16	.31
Skills Knowledge Total	5	384.3	(54.3)	388.4	28	412.2	(52.0)	408.1	25	2.45	.12	.36
• **Scales of Independent Behavior** (SIB)♠												
Motor Skills	3	435.5	(38.3)	440.2	28	448.2	(33.1)	443.6	24	.25	.62	.09
Social/Communication Skills	6	454.2	(25.0)	455.9	28	465.5	(22.0)	463.7	24	2.14	.15	.31
Personal Living Skills	3	454.8	(26.8)	457.8	28	463.1	(20.3)	460.1	24	.24	.63	.09
Community Living Skills	5	430.2	(28.3)	432.4	28	445.5	(26.6)	443.3	24	3.11	.08	.39
Total	3,5	443.7	(24.1)	446.6	28	455.7	(22.0)	452.8	24	1.63	.21	.26
• **Teacher Developmental SPECS**◆												
Communication	4	6.5	(1.4)	6.5	28	7.0	(1.8)	7.0	25	1.08	.30	.36
Sensorimotor	3	15.0	(2.6)	15.2	28	16.0	(2.6)	15.8	25	.63	.43	.23
Physical		11.3	(2.2)	11.3	28	12.2	(1.9)	12.2	25	2.59	.11	.41
Self-Regulation	6	13.7	(3.4)	13.8	28	14.8	(3.4)	14.7	25	.91	.35	.26
Cognition	5	5.4	(2.2)	5.5	28	6.1	(2.5)	6.0	25	.47	.50	.23
Self-Social	6	12.9	(3.5)	13.1	28	13.8	(3.7)	13.7	25	.42	.52	.17
• **Social Skills (SSRS)**▲												
Parent Evaluation of Social Skills	1	85.6	(21.6)	85.9	28	87.7	(19.1)	87.5	24	.11	.75	.07
Parent evaluation of problem behaviors		104.6	(15.9)		28	104.3	(15.4)		24	.01	.93	.02
Teacher evaluation of Social Skills	1	86.7	(15.7)	86.9	28	88.0	(17.5)	87.8	25	.04	.84	.06
Teacher Evaluation of Problem behaviors		110.3	(14.0)		28	105.3	(11.5)		25	1.95	.17	.36
• **Perceived Competence and Social Acceptance**&												
Cognitive Competence	5	20.8	(2.6)	20.8	21	20.1	(2.8)	20.1	21	.95	.34	-.27
Physical Competence	3,8	16.4	(5.4)	17.2	21	18.1	(4.0)	17.3	21	.00	.96	.02
Social Acceptance by Peers		17.3	(4.2)		21	17.7	(4.5)		21	.10	.75	.10
Social Acceptance by Mother		18.4	(3.8)		21	18.0	(3.8)		21	.16	.69	-.11
• **School Placement**▼												
% not eligible for special education	6	10.7		11.4	28	12.0		11.3	25	.00	.99	-.04
% in typical classroom	6	21.4		22.6	28	36.0		34.8	25	.96	.33	.30
% in full-time special classroom	6	64.3		62.5	28	48.0		49.8	25	.88	.35	.30

Covariance adjusted means

$ Covariates included BDI pretest scores (1 = Personal-Social, 2 = Adaptive Behavior, 3 = Motor, 4 = Communication, 5 = Cognitive, 6 = Total) and other pretest variables (7 = Child's Age, 8 = Number of Siblings in the Home)

^ $$ES = \frac{\text{Center-Based + PIE Adj}\bar{x} - \text{Center-based Adj}\bar{x}}{\text{Center-Based SD}}$$

Negative effect sizes indicate that the children in the parent involvement group are doing less well than those in the center-based group.

◆ Each SPECS score includes a different number of items, each of which are ranked by the teacher on a Likert-type scale of 1 to 5. A score of 5 represents development in that area that is typical of peers and a score of 1 represents development that is atypical or problematic. Therefore, the optimal developmental score for communication is 10; sensorimotor, 20; physical, 15; self-regulation, 20; cognition, 10; self-social, 20.

@ Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

♣ The WJ-R provides broad knowledge and skills knowledge raw achievement scores to measure child developmental outcomes. Higher scores indicate greater achievement.

♠ The SIB measures, from parent report, the child's degree of independence in the social/communication, personal living, and community living domains. High scores represent higher degrees of independent behaviors.

▼ Scores in this category represent percentages related to child's present educational placement. The questions for Reassessments #4 and #5 differed slightly from those used at Reassessment #6.

▲ These scales provide the parent and teacher's perception of the child's social skills and their problems. Higher scores represent more, either more skills or more problems.

& Scales provide child's perception of these 4 categories of self-competence. Higher scores are interpreted as better.

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Table 9.10 (continued)

Comparison of Reassessment Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups (Reassessments #1 - #6) in the Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
REASSESSMENT #6												
• **Age in months at Reassessment #6**[@]		110.0	(10.5)		28	108.6	(11.2)		25	.22	.64	-.13
• **Woodcock-Johnson Revised Achievement Raw Scores for:**[♣]												
Broad Knowledge Total	5	450.8	(31.8)	453.3	28	462.4	(27.0)	459.9	25	.97	.33	.21
Skills Knowledge Total	5	398.4	(54.0)	402.9	28	425.8	(57.9)	421.3	25	2.00	.16	.34
• **Scales of Independent Behavior** (SIB)[♠]												
Motor Skills	3	440.0	(37.8)	445.0	28	449.4	(34.7)	444.3	25	.01	.91	-.02
Social/Communication Skills	6	457.6	(25.9)	459.3	28	466.8	(21.0)	465.1	25	1.05	.31	.22
Personal Living Skills	3	458.1	(27.6)	461.2	28	467.5	(17.9)	464.4	25	.46	.50	.12
Community Living Skills	5	435.3	(28.4)	437.5	28	449.5	(23.4)	449.5	25	2.70	.11	.42
Total	5,6	447.9	(24.3)	450.8	28	458.4	(21.2)	455.5	25	.90	.35	.19
• **Social Skills (SSRS)**[▲]												
Parent Evaluation of Social Skills	1	88.1	(25.4)	88.4	28	91.6	(19.5)	91.3	25	.27	.60	.11
Parent evaluation of problem behaviors		108.5	(12.0)		28	100.1	(18.4)		25	3.96	.05	.70
Teacher evaluation of Social Skills	1	88.6	(14.7)	88.8	28	92.9	(16.2)	92.7	24	.97	.33	.27
Teacher Evaluation of Problem behaviors		108.5	(18.3)		28	101.0	(12.0)		24	2.94	.09	.41
• **Perceived Competence and Social Acceptance**[&]												
Cognitive Competence	5	18.7	(3.5)	18.8	23	20.5	(2.9)	20.4	21	2.84	.10	.46
Physical Competence	3,8	16.9	(5.2)	17.4	23	19.2	(3.9)	18.7	21	1.07	.31	.25
Social Acceptance by Peers		17.2	(3.5)		23	18.6	(5.3)		21	1.08	.30	.40
Social Acceptance by Mother		16.7	(3.9)		23	16.1	(4.3)		21	.17	.69	-.15
• **School Placement**[▼]												
% not eligible for special education	6	7.1		7.5	28	12.5		12.1	24	.30	.59	.16
% in typical classroom	6	19.2		21.1	26	38.1		36.2	21	1.66	.20	.39
% in full-time special classroom	6	80.8		78.9	26	61.9		63.8	21	1.29	.26	.39

[#] Covariance adjusted means

[$] Covariates included BDI pretest scores (1 = Personal-Social, 2 = Adaptive Behavior, 3 = Motor, 4 = Communication, 5 = Cognitive, 6 = Total) and other pretest variables (7 = Child's Age, 8 = Number of Siblings in the Home)

[^]
$$ES = \frac{\text{Center-Based + PIE Adj}\bar{x} - \text{Center-based Adj}\bar{x}}{\text{Center-Based SD}}$$
Negative effect sizes indicate that the children in the parent involvement group are doing less well than those in the center-based group.

[♦] Each SPECS score includes a different number of items, each of which are ranked by the teacher on a Likert-type scale of 1 to 5. A score of 5 represents development in that area that is typical of peers and a score of 1 represents development that is atypical or problematic. Therefore, the optimal developmental score for communication is 10; sensorimotor, 20; physical, 15; self-regulation, 20; cognition, 10; self-social, 20.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[♣] The WJ-R provides broad knowledge and skills knowledge raw achievement scores to measure child developmental outcomes. Higher scores indicate greater achievement.

[♠] The SIB measures, from parent report, the child's degree of independence in the social/communication, personal living, and community living domains. High scores represent higher degrees of independent behaviors.

[▼] Scores in this category represent percentages related to child's present educational placement. The questions for Reassessments #4 and #5 differed slightly from those used at Reassessment #6.

[▲] These scales provide the parent and teacher's perception of the child's social skills and their problems. Higher scores represent more, either more skills or more problems.

[&] Scales provide child's perception of these 4 categories of self-competence. Higher scores are interpreted as better.

Reassessment #2, #3, and #4 group comparisons. The findings for Reassessments #2, #3, and #4 were somewhat different than were the Reassessment #1 findings. At Reassessments #2, #3, and #4, the children in the center-based with parent involvement group performed statistically significantly better on the total BDI than did the children in the center-based only group (see Table 9.10). They also scored statistically significantly higher on the domains of personal-social development at Reassessments #3 and #4, and cognitive development at Reassessments #2 and #3. The effect sizes of these differences also increased from reassessment to reassessment.

Other measures taken at Reassessment #4 seem to agree with the BDI differences between the groups for this reassessment. The teachers evaluated the children's development in six areas, communication, sensorimotor, physical, self-regulation, cognition, and self/social using the Developmental SPECS (Bagnato & Neisworth, 1989). The children in the parent involvement group did statistically significantly better than the children in the center-based group on two of the six scales (i.e., self-regulation and self/social subscales).

Information allowing the investigation of the effect of parent instruction on later school placement was provided by teacher questionnaires at Reassessments #2 and #4. At Reassessment #2, only 12 of the 56 children were in school, but by Reassessment #4, the youngest child in the sample was over five years of age. At this time, 50 of the 52 children tested were in some type of public school (preschool to second grade), one was in a private preschool program, and one in a home-based program. More children in the center-based only group were eligible for special education services (96% compared to 86.4% for the center-based with parent involvement group). Likewise, more children in the center-based only group attended special education classes; conversely, more children in the center-based with parent involvement group attended typical classes (see Table 9.10). Although these statistics favored the children in the center-based with parent involvement group, the differences between groups were not statistically significant. The effect sizes ranged from .28 to .45.

Reassessment #5 and #6 comparisons. At Reassessments #5 and #6, a number of the child development measures changed. The Woodcock-Johnson Tests of Achievement (WJ-R) and the Scales of Independent Behavior replaced the Battelle Developmental Inventory

(BDI). Measures of the child's social skills and the child's perceptions of their own competencies and acceptance were added. (Some children were not able to complete the measure of self-competence because of they did not understand the questions.) Generally, at both reassessments, child performance on the various measures was comparable between the two groups, although the children in the center-based with parent involvement group usually scored higher on measures of development/achievement social skills, self competence, and school placement than the children in the center-based only group (refer to Table 9.10). The findings on these measures are discussed in that order.

The Woodcock-Johnson Achievement Test--Revised provides two domain scores, a broad knowledge score, and a skills knowledge score. The broad knowledge domain includes science, social studies and humanities sub-scales, and the skills knowledge domain includes letter-word identification, applied problems and dictation sub-scales. The Scales of Independent Behaviors provided four sub-scale scores and a total score. The Motor Scale includes gross motor and fine motor skills. The Social/Communications Scale includes social interaction, language comprehension and language expression scores. The Personal Living Scale includes catering and meal preparation, toileting, dressing, self-care, and domestic skills. The Community Living Scale includes time and punctuality skills, money and value skills, work skills, and home-community orientation skills.

No statistically significant differences were found on the Broad Knowledge or Skills Knowledge domains of the WJ-R at Reassessments #5 or #6, although the effect sizes for Skills Knowledge showed a standard deviation advantage for the center-based with parent involvement group. The children in the center-based with parent involvement group scored statistically significantly higher on the Community Living Scale subscale of the SIB at Reassessment #5 and nearly so at Reassessment #6 (_p_ = .11). The respective effect sizes were .39 and .42.

The findings on the other measure of child development, the Developmental SPECS completed by the teachers at Reassessment #5 showed no differences between the groups. Parent and teacher ratings of the children's social skills (SSRS), were similar for the two groups at both reassessments. Ratings of problem behaviors were similar across groups at Reassessment #5. However, at Reassessment #6, parents and teachers rated the children in the center-based only group as having statistically significantly more problem behaviors than the center-based with parent involvement group.

Four dimensions of perceived competence and acceptance were measured: cognitive competence, physical competence, peer acceptance, and maternal acceptance. One statistically significant difference was found at Reassessment #6. The children in the center-based with parent involvement group perceived themselves as being more cognitively competent than did the center-based group of children.

Information concerning school placement was again provided by the teachers at Reassessments #5 and #6. At Reassessment #6, 51 of the children were in public schools, one was in a private school, and one was in a home school. The children were in grades one to four. Across the reassessments 4 to 6, more of the children in the center-based only group were eligible for special education, fewer were in typical classrooms, and more were in special education classrooms than were the children in the center-based with parent involvement group, but the differences between the groups were not statistically significant.

In sum, some advantage in development was found on the BDI scores across reassessments for the children in the center-based with parent involvement. The statistically significant difference in personal-social development at Reassessment #1 might have been a chance finding, but with the difference being statistically significant at Reassessments #3 and #4, it appears to be a real finding.

Similarly, there was a consistent statistically significant advantage on the BDI cognitive domain at Reassessments #2 and #3, and the total BDI score at Reassessments

#2, #3, and #4 for the children in the center-based with parent involvement group. Again, the consistency of scores appear to indicate a real finding. Relatively few of the other differences between groups were statistically significant, and these may be attributed to chance. However, all the statistically significant differences (e.g., SPECS self-regulation and self-social scores at Reassessment #4, SIB community living scale at Reassessment #5, and SSRS problem behavior scores by both parents and teachers at Reassessment #6) favored the children in the center-based with parent involvement group. None of the statistically significant findings favored the children in the center-based with parent involvement group.

In addition, when the difference between groups is not statistically significant, the difference in scores is attributed to error measurement. However, when a vast majority of the comparisons (69 of 83) favor the center-based with parent involvement group, the finding of some developmental advantage for this group appears to be substantiated.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

The research question addressed in this part of the analyses was whether adding a parent instruction component to an early intervention program results in changes in family functioning. To investigate these possible effects, measures of parenting stress (PSI), family adaptability and cohesion (FACES III), and family support (FSS) were given to the parents at Reassessments #1 to #4. In addition, at Reassessment #1 and #2, the Child Improvement Questionnaire was given to measure the parents' perception of the factors that influence or control the progress of the child. At Reassessment #5, the Comprehensive Evaluation of Family Functioning (CEFF) was included as a measure of functioning in those areas that may be impacted by having a child with special needs. The Parent Self-Awareness Scale was completed to measure the parent's perceived level of capabilities, and the Family APGAR was used as a general measure of family functioning.

At Reassessment #6, the Parenting Stress Index was reintroduced in place of the CEFF. The short form of the Parenting Stress Index (PSI/SF) was used. This form includes 36 of the items on the original PSI. The domain scores reported are parenting distress, parent-child dysfunctional interaction, and difficult child. The Family Functioning Style Scale was added to measure family strengths.

Results of the analysis of measures of family functioning for the five reassessments are shown in Table 9.11.

Table 9.11

Comparison of Reassessment Measures of Family Functioning for Subjects in Center-Based Only and Center-Based with Parent Involvement Groups (Reassessments #1 - #6) in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates$	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	F	p Value	ES^
REASSESSMENT #1														
• **Parent Stress Index**◆														
Child Related Range (47 to 235)	0,1,2,3	121.7	(23.5)	121.1	89	26	122.2	(16.8)	122.9	90	25	.15	.70	-.08
Other Related Range (54 to 270)	0,2,4,5	135.8	(31.8)	137.4	75	24	139.8	(21.6)	138.2	76	25	.03	.87	-.03
• **Family Adaptation and Cohesion Evaluation Scales (FACES)***														
Adaptability Range (0 to 50)	4,6,8	25.3	(5.3)	25.0		28	24.8	(5.6)	25.1		27	.00	.95	.02
Cohesion Range (0 to 50)	7,9	37.0	(6.2)	37.6		27	41.0	(4.3)	40.4		28	6.21	.02	.45
• **Family Support Scale (FSS)&**	2,3,4	27.5	(10.4)	27.7	51	26	32.3	(10.5)	32.1	67	26	3.30	.08	.42
• **Child Improvement Questionnaire-Revised#**														
Professional		19.0	(3.6)			28	19.6	(3.6)			28	.31	.58	.17
Divine Intervention		11.3	(3.8)			28	10.5	(3.3)			28	.75	.39	.21
Parent		24.1	(3.9)			28	24.6	(2.3)			28	.29	.59	.13
Child		21.5	(3.9)			28	20.0	(3.5)			28	2.18	.15	-.38
Chance		9.2	(3.0)			28	9.8	(1.9)			28	.73	.40	-.20
• **CES-D (depression)**◆*		36.4	(12.4)			28	33.4	(11.7)			28	.89	.35	.24

* Results computed among t-tests. Means are not adjusted.

# Covariance adjusted means.

$ 0 = PSI other related, 1 = PSI child related stress, 2 = FSS total score, 3 = BDI total score, 4 = FILE, 5 = Mother's work hours outside home, 6 = Mom's age at assessment, 7 = Dad's age at assessment, 8 = FACES assessment adaptability of family interaction patterns, 9 = FACES assessment cohesiveness of family interaction patterns.

& Analyses for FSS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported based on all assessments collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

◆ Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

^ $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{X} - \text{Center-based Adj.}\bar{X}}{\text{Center-Based SD}}$$

# Assesses parental perceptions of factors that affect child's developmental progress. Higher scores on professional, parent, and child domains are considered better. Lower scores on divine intervention and chance are considered better.

◆ Assesses parental depression; lower scores are better.

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Table 9.11 (continued)

Comparison of Reassessment Measures of Family Functioning for Subjects in Center-Based Only and Center-Based with Parent Involvement Groups (Reassessments #1 - #6) in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates[$]	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	%ile	n	F	p Value	ES[^]
REASSESSMENT #2														
• **Parent Stress Index**[♦]														
Child Related Range (47 to 235)	0,1,3,4,6	117.4	(19.9)	116.8	86	21	114.7	(16.2)	115.4	82	20	.14	.71	.07
Other Related Range (54 to 270)	0,4	126.8	(26.3)	127.8	63	21	137.8	(18.4)	136.7	75	20	4.07	.05	-.34
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]														
Adaptability Range (0 to 50)	5,6	24.7	(5.4)	24.6		20	25.9	(5.2)	26.0		20	1.39	.25	.26
Cohesion Range (0 to 50)	7	38.8	(5.8)	39.1		21	42.0	(3.9)	41.7		20	3.69	.06	.45
• **Family Support Scale (FSS)**[&]	0,2,4	29.8	(10.3)	30.5	63	20	31.9	(9.9)	31.3	63	19	.11	.74	.08
• **Child Improvement Questionnaire-Revised**[*][@]														
Professional	--	24.9	(5.2)			21	22.7	(4.6)			19	1.89	.18	-.42
Divine Intervention	--	14.2	(4.7)			21	11.4	(3.9)			19	4.19	.05	.60
Parent	--	28.8	(4.8)			21	27.8	(4.3)			19	.40	.53	-.21
Child	--	23.9	(4.3)			21	23.6	(4.3)			19	.06	.81	-.07
Chance	--	12.2	(3.6)			21	10.8	(3.0)			19	1.60	.21	.39

[*] Results computed among t-tests. Means are not adjusted.

[#] Covariance adjusted means.

[$] 0 = PSI other related, 1 = PSI child related stress, 2 = FSS total score, 3 = BDI total score, 4 = FILE, 5 = Dad's age at assessment, 6 = FACES assessment adaptability of family interaction patterns, 7 = FACES assessment cohesiveness of family interaction patterns.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all assessments collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[♦] Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

[^] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[@] Assesses parental perceptions of factors that affect child's developmental progress. Higher scores on professional, parent, and child domains are considered better. Lower scores on divine intervention and chance are considered better.

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Table 9.11 (continued)

Comparison of Reassessment Measures of Family Functioning for Subjects in Center-Based Only and Center-Based with Parent Involvement Groups (Reassessments #1 - #6) in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	F	p Value	ES[^]
REASSESSMENT #3														
• **Parent Stress Index**[♦]														
Child Related Range (47 to 235)	1,5	119.3	(22.1)	118.5	87	26	116.6	(14.1)	117.4	86	23	.06	.81	.05
Other Related Range (54 to 270)	0,4,5	128.0	(27.0)	129.4	65	26	129.0	(15.7)	127.6	63	22	.13	.72	.07
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]														
Adaptability Range (0 to 50)	6,7	24.3	(5.3)	24.6		26	24.5	(4.4)	24.3		24	.08	.78	-.06
Cohesion Range (0 to 50)	8	35.9	(7.2)	36.5		26	38.1	(5.0)	37.5		24	.42	.52	.14
• **Family Support Scale (FSS)**[&]	2,4	30.5	(13.7)	30.4	59	26	26.5	(8.0)	26.6	48	23	1.76	.19	-.28
REASSESSMENT #4														
• **Parent Stress Index**[♦]														
Child Related Range (47 to 235)	1,3,5	118.0	(20.6)	117.6	87	28	112.8	(16.2)	113.3	79	23	.94	.34	.21
Other Related Range (54 to 270)	0,1,5,9	127.3	(25.1)	130.3	66	28	133.4	(16.6)	130.4	66	23	.00	.99	.00
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]														
Adaptability Range (0 to 50)	7	26.1	(6.2)	26.3		28	24.6	(5.2)	24.4		24	1.49	.23	-.31
Cohesion Range (0 to 50)	8,10	38.0	(6.0)	38.4		28	40.1	(4.3)	39.7		23	.99	.33	.22
• **Family Support Scale (FSS)**[&]	2,3,7	27.0	(9.7)	27.4	48	27	27.5	(8.4)	27.1	48	24	.01	.93	-.03
• **Teacher Rating of Parents' Participation in Education Program:**														
Attendance*		4.2	(1.2)			22	5.3	(1.8)			21	5.62	.02	.92
Support/Participation	11	15.1	(4.0)	14.9		21	17.9	(5.5)	18.1		19	4.91	.03	.80
Knowledge*		13.6	(3.6)			20	18.6	(7.9)			19	6.38	.02	1.39

[*] Results computed among t-tests. Means are not adjusted.

(continued)

[$] 0 = PSI other related, 1 = PSI child related stress, 2 = FSS total score, 3 = BDI total score, 4 = FILE, 5 = Mother's years of education, 6 = Father's years of education, 7 = FACES assessment adaptability of family interaction patterns, 8 = FACES assessment cohesiveness of family interaction patterns, 9 = Number of siblings receiving special ed. services, 10 = FRS total score, 11 = Total income.

[&] Analyses for FSS and FRS are based on raw scores indicating number of supports or resources indicated by family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all assessments collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[♦] Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

[^] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

Table 9.11 (continued)

Comparison of Reassessment Measures of Family Functioning for Subjects in Center-Based Only and Center-Based with Parent Involvement Groups (Reassessments #1 - #6) in the 1986 Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates$	$\bar{X}$	(SD)	Adj.$\bar{X}$#	n	$\bar{X}$	(SD)	Adj.$\bar{X}$#	n	ANCOVA F	p Value	ES^
REASSESSMENT #5												
• **Family Support (FSS)**												
Family Support Total	2,7,8	27.3	(11.6)	27.8	28	25.4	(11.3)	25.8	24	.47	.50	-.17
• **Family Functioning (CEFF)**♦												
Time Demands (0-30)	4	14.5	(5.6)	14.7	28	14.1	(5.7)	13.9	24	.27	.61	.14
Acceptance-Problems (0-55)	1,4	26.3	(6.7)	26.3	28	24.9	(4.2)	24.9	23	.88	.35	.21
Coping (0-35)	1	15.7	(5.2)	15.6	28	15.2	(4.0)	15.4	23	.03	.85	.04
Social Relationship (0-35)	1,4	15.1	(5.2)	15.2	28	13.6	(4.2)	13.5	23	1.69	.20	.33
Financial (0-10)		4.8	(2.6)	4.8	28	4.8	(1.8)	4.8	24	.01	.91	.00
Well Being (0-30)	4	15.0	(4.2)	15.2	28	14.5	(3.7)	14.4	24	.51	.48	.19
Sibling Relationship (0-60)		25.1	(11.7)	24.9	28	26.2	(8.6)	26.5	23	.30	.59	-.12
Situational Stress (0-55)	1	22.6	(9.3)	22.5	28	20.2	(9.0)	20.4	23	.67	.42	.23
Total (0-195)	7,8,9	91.5	(23.3)	90.0	28	86.7	(17.9)	88.2	23	.10	.75	.08
Total Number of Problems (0-39)	3,16	7.6	(8.5)	7.8	28	7.0	(8.3)	6.1	22	.54	.46	.20
• **Family Function (APGAR)**												
Adaptability (0-4)	4	2.9	(.9)	2.9	28	3.0	(.8)	3.1	24	.53	.47	.22
Partnership (0-4)	4,7	2.6	(.8)	2.6	28	2.9	(.8)	2.9	24	1.41	.24	.38
Growth (0-4)	4,7	2.4	(1.0)	2.4	28	2.8	(.7)	2.8	24	2.74	.10	.40
Affection (0-4)	4,7	2.9	(.9)	2.9	28	2.7	(.7)	2.7	24	.58	.45	-.22
Resolve (0-4)	4,7	2.9	(.8)	2.9	28	2.8	(.7)	2.8	24	.39	.54	-.13
Total (0-20)	4,7	13.7	(3.5)	13.7	28	14.2	(2.9)	14.2	24	.26	.62	.14
• **Family Participation in Child's Educational Program**												
Knowledge of Education Program	4	9.1	(2.3)	9.0	27	9.9	(2.1)	9.9	25	2.25	.14	.39
Support of Education Program	4,6	16.3	(3.4)	16.1	27	17.4	(3.1)	17.5	25	2.64	.11	.41
• **Parent Self Awareness Scale** Total Score	2,4,5,7	41.9	(8.4)	42.4	27	41.6	(6.3)	41.1	24	.39	.53	-.15

$ 1 = PSI child related stress, 2 = FSS total score, 3 = FILE, 4 = Mother's years of education, 5 = Child's age at assessment, 6 = Mom's age at assessment, 7 = FACES assessment adaptability of family interaction patterns, 8 = Child living with both parents, 9 = PSI total score.

^ $$\text{ES} = \frac{\text{Center-Based + PIE Adj}\bar{x} - \text{Center-based Adj}\bar{x}}{\text{Center-Based SD}}$$

Covariance adjusted means.

♦ Analyses for the CEFF are based on raw scores: Lower scores represent less stress and are considered better.

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Table 9.11 (continued)

Comparison of Reassessment Measures of Family Functioning for Subjects in Center-Based Only and Center-Based with Parent Involvement Groups (Reassessments #1 - #6) in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates$^{\$}$	$\bar{X}$	(SD)	Adj.$\bar{X}^{\#}$	%ile	n	$\bar{X}$	(SD)	Adj.$\bar{X}^{\#}$	%ile	n	F	p Value	ES^
REASSESSMENT #6														
• **Family Support (FSS)**														
Family Support Total	1,6,8	27.1	(14.3)	27.8		26	27.8	(9.5)	27.0		24	.07	.80	-.06
• **Parent Stress Index◆ (PSI-S) Short Form**														
Parenting Distress	2,7	28.6	(10.1)	29.0	70	28	28.2	(7.0)	27.8	65	24	.25	.62	.12
Parent-Child Dysfunction	3,9	25.4	(7.3)	25.1	80	28	26.5	(6.9)	26.8	90	25	.91	.34	-.23
Difficult Child	3,7,9	31.5	(8.6)	31.2	80	28	30.2	(7.6)	30.5	80	24	.12	.73	.08
• **Family Function (APGAR)**														
Adaptability (0-4)	2	3.1	(.7)	3.1		28	3.4	(.6)	3.4		25	3.21	.08	.43
Partnership (0-4)	2,6	2.7	(.8)	2.7		28	2.9	(.6)	2.9		25	.79	.38	.25
Growth (0-4)	2,6	2.5	(.8)	2.5		28	3.0	(.6)	3.0		25	4.90	.03	.63
Affection (0-4)	2,6	2.8	(.9)	2.9		28	2.8	(.7)	2.8		25	.03	.87	-.11
Resolve (0-4)	2,6	3.0	(.7)	3.1		28	2.8	(.7)	2.7		25	2.47	.12	-.57
Total (0-20)	2,6	14.3	(3.2)	14.3		28	15.0	(3.0)	15.0		25	.70	.41	.22
• **Family Participation in Child's Education Program**														
Knowledge of Education Program	2	9.0	(2.4)	9.0		28	9.4	(2.4)	9.4		24	.49	.49	.17
Support of Education Program	2,5	16.2	(3.4)	16.0		28	17.1	(3.7)	17.3		24	1.99	.17	.38
• **Parent Self Awareness Scale Total Score**	1,2,4,6	42.4	(7.9)	42.6		26	43.4	(5.9)	43.2		24	.11	.75	.08
• **Family Functioning Style Scale (FFSS)**														
Family Identity	1,6	30.65	(6.5)	31.0		26	31.2	(3.8)	30.8		24	.02	.90	-.03
Information Sharing	1	11.0	(2.9)	11.0		26	11.8	(2.1)	11.8		24	1.15	.29	.28
Coping/Resource Mobilization	6,7	32.4	(7.4)	32.7		28	33.5	(3.8)	33.3		23	.13	.72	.08

$^{\$}$ 1 = FSS total score, 2 = Mother's years of education, 3 = Father's years of education, 4 = Child's age at assessment, 5 = Mom's age at assessment, 6 = FACES assessment cohesiveness of family interaction patterns, 7 = FRS total score, 8 = Child living with both parents, 9 = BDI Communication Raw Score.

^ $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{X} - \text{Center-based Adj.}\bar{X}}{\text{Center-Based SD}}$$

# Covariance adjusted means.

◆ Analyses for the PSI are based on raw scores. Lower scores represent less stress and are considered better. This scale provides norms. High percentiles represent more stress.

Family social support. The difference in reported social support was significantly different at Reassessment #1 just after the parents had attended the classes (p = .08, ES = .42). The families in center-based with parent involvement group reported more social support than did the families in the center-based only group. This finding was not replicated across the subsequent reassessments.

Parenting stress. Parenting stress was measured by the PSI at the initial assessment and the first four reassessments. Two domain scores of parenting stress are provided, one focusing on child-related stress and one focusing on parent stress in other relationships. The child domain, or child-related stress, contains items

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related to the: child's adaptation to change and transitions; the child's demands for attention or action; the child's negative expressions of mood, crying, withdrawal, and depression; and the child's hyperactivity and distractibility. The degree to which the child meets the parent's idealized expectations and the degree to which the child interacts positively with the parent are also assessed in the child domain. The parent domain assesses perceptions of depression, sense of competence, infringements on personal freedom, social isolation, support provided by the spouse, and parental health. The use of the PSI was discontinued at Reassessment #5 and another measure of family functioning and stress was used. The PSI was reinstated at Reassessment #6 with the use of the short form (PSI/SF). The two groups of families experienced similar levels of stress across Reassessments #1 to #4 except for one statistically significant difference at Reassessment #2 for the parent domain. The parents in the center-based only group reported statistically significantly less stress due to other relationships in the parent's life. Given the consistent pattern of no differences at all on other reassessments, this was probably the result of sampling fluctuation associated with the reduced sample size at Reassessment #2. The families in both groups consistently experienced more child-related stress than parent-related stress with child-related stress for both groups being at the 80th percentile or higher. Parent-related stress scores for both groups were at about the 75th percentile at Reassessment #1, and the average percentile across reassessments 2 to 4 was approximately 66.

At Reassessment #5, the Comprehensive Evaluation of Family Functioning (CEFF) was administered to the parents in order to measure aspects of family functioning and stress. Higher scores indicate more problems. Scores for eight subscales and a total score based on six subscales (not including sibling relationships and situation stress subscales) are reported (see Table 9.11). No national norms are provided. The two groups reported similar stress on all the subscales. By dividing the total score of each group by the number of items, we have a mean rating of 2.3 for the center-based only group and 2.2 for the center-based with parent involvement group. On the scale, a rating of 2 indicates that these problems rarely occur. A rating of 3 indicates that these problems sometimes occur. These scores indicate that on average, the problems listed in the CEFF are not considered to be frequent stresses. The total mean number of problems for each group (7.6 for the center-based only group and 7.0 for the center-based with parent involvement group) out of 39 problems listed also indicates that the families didn't consider themselves to be especially stressed.

At Reassessment #6, the PSI/SF scores revealed that the parents in both groups reported similar scores on the three domains (parenting distress, parent-child dysfunction, and difficult child). Their scores were all above average when compared to the national norms (see Table 9.11).

Family functioning. Family adaptability and cohesion were the measures of family functioning for the preassessment and reassessments (1 - 4). No statistically significant differences were found between the mean group scores on family adaptability, and the relative position of the two groups with regard to being more adaptable changed at different reassessments. The adaptability scores averaged midway on the adaptability continuum (ranging from rigid to very flexible) (Olson & Tiesel, 1991).

The center-based with parent involvement group reported statistically significantly higher (better) cohesion scores at Reassessments #1 and #2 than did the center-based only group. The cohesion scores (for both groups) also lie midway in the cohesion continuum (ranging from disengaged to very connected) (Olson & Tiesel, 1991).

Family functioning was measured with the Family APGAR Scale at Reassessments #5 and #6. Subscales represent single items on this questionnaire of 5 questions. There were significant differences on one subscale score at Reassessment #5 and two subscales at Reassessment #6. Total score representing satisfaction with family adaptability, partnership, growth, affection, resolve, is also provided. The two groups reported similar satisfaction at both reassessments. The average of the means of the five scales for both groups is almost 3, which is defined as "almost always satisfied."

An additional measure, the Family Functioning Style Scale was completed at Reassessment #6. This scale measures parent's perception about the family strengths in the dimensions of family identity, information sharing, and coping and resource mobilization. Again, no statistically significant differences were found between the groups on the three family strength scales. When the 3 scale scores were each averaged (dividing the scale total by the number of items), the average responses for both groups were 3s (on a scale of 0-4) which meant that the statement was perceived as generally like my family and reflected a perception of general family strength.

Parent responsibility and effectiveness. The Child Improvement Questionnaire which measures the parent's perception of factors that affect the developmental progress of their child with disabilities was completed at Reassessments #1 and #2. At neither reassessment did the parents in the two groups have statistically significantly different perceptions of the influence from professionals, divine intervention, parent, child, or chance, except for the perception concerning divine intervention as Reassessment #2.

The Parent Self-Awareness Scale administered at Reassessments #5 and #6 attempts to measure the parent's perception of her/his personal decision-making and information capabilities. The two groups of parents expressed similar beliefs concerning their capabilities.

Parent involvement in child's educational program. It is possible that the P.I.E. program might have influenced the parents' attitudes concerning responsibility for and participation with interveners in the child's education program. At Reassessments #2, and #4, teachers rated the parents' participation in the educational program from less than other parents (1) to more than other parents (3) on 15 items. The items were summed into three variables (parent attendance, parent knowledge, and parent support). At Reassessment #5, the scale was revised to 11 items, which were summed into two variables, parent knowledge and support. This same scale was completed at Reassessment #6. At Reassessment #2, the number of children in public school were few, and no differences were seen between the groups in parent attendance, knowledge, and support. However, at Reassessment #4, the group comparison (see Table 9.11) showed that the parents who participated in the PIE program were considered more knowledgeable about their children's education (p = .02, ES = 1.39), more supportive (p = .03, ES = .80), and attended more of the educational meetings (p = .02, ES = 1.39) than the parents in the center-based only group. At Reassessments #5 and #6, the differences on these variable were not statistically significant, but the effect sizes still favored the center-based with parent involvement group.

Parent Attendance: Participation Comparison

Straightforward comparisons of all subjects in each group (center-based only vs. center-based with parent involvement) may not provide an adequate test of the effectiveness of this type of parent involvement program because data for parents who were invited, but did not attend regularly were included in the center-based with parent involvement group data. Attendance at the instructional sessions varied a great deal with a parent from one family not attending any of the 15 sessions, and a parent from one family attending all 15. On the average, the parents attended 9 of the 15 sessions. Thirteen parents attended 11 or more sessions, 6 parents attended 7 to 10 sessions, and 9 parents attended 6 sessions or less. Analyses were performed comparing the BDI, WJ-R, and SIB scores of the children whose parents attended most of the instructional sessions (11 or more) with those whose parents were in the center-based only group and were not invited to the PIE sessions (28). Parent outcome measures were also compared. These participation comparisons were done to see if the parents who participated most extensively in the PIE program, realized greater benefits than those who did not participate in the parent involvement component (i.e., were in the center-based only group). The generalizability of these analyses are limited by the small number (13) in the high attending group.

To compare group differences between the high attending parent group and the center-based group, preliminary analyses were performed to see how the two groups matched on demographic and assessment variables, and to identify covariates. The demographic characteristics of the high attending group and the center-based only group were very similar, with statistically significant differences on only 3 of 16 variables (see Table 9.12). The covariates chosen, usually the same scale taken at assessment, are identified in Table 9.13.

The effect sizes on Table 9.13 show that the mean scores of the children whose parents were high attenders were greater on all the developmental measures across 6 reassessments, except for 2 measures at Reassessment #1. However, only five comparisons showed a statistically significant advantage for the high attending group (i.e., the total score at Reassessments #2 and #3, the personal/social score at Reassessments #1 and #2, and the cognitive score at Reassessment #3) (see Table 9.13).

Comparisons of family functioning were also performed with the high attender and the center-based only groups. Across reassessments, the two groups did not differ significantly on parenting stress (as measured by the PSI), family social support (FSS), or family adaptability (FACES III). However, family cohesion (FACES III) scores were statistically significantly different at Reassessments #1 ($\underline{p}$ value = .006, ES = .68), #2 ($\underline{p}$ value = .03, ES = .73), and #4 ($\underline{p}$ value = .10, ES = .50), with the families in the high attending reporting more positive scores. At Reassessment #5, no differences were found on the family functioning measures (as measured by the CEFF and APGAR) except for one subdomain on the Family APGAR scale. In sum, the findings on child and family functioning in this participation comparison are similar to, but are no stronger than, the findings of the comparisons of the total center-based with parent involvement group and the center-based only group.

Table 9.12

Comparison on Key Demographic Variables of the Center-Based Only and High Attendance Groups in the 1986 Parent Involvement Study

	Center-Based Only			Attended 11 or more PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Age of child in months as of 11/15/86	43.0	10.5	28	42.1	11.4	13	.80	-.09
• Age of mother in years	33.4	5.8	28	31.9	7.2	13	.48	-.26
• Age of father in years	35.9	6.2	27	35.0	8.4	13	.68	-.15
• Percent Male*	57.1		28	30.8		13	.12	-.47
• Years of Education--Mother	13.8	1.7	28	13.5	1.6	13	.56	-.18
• Years of Education--Father	13.8	2.1	28	14.3	2.2	13	.47	.24
• Percent with both parents living at home*	78.6		28	100.0		13	.07	.44
• Percent of children who are caucasian*	82.1		28	92.3		13	.40	.17
• Hours per week mother employed	8.4	13.7	26	2.6	6.4	13	.16	-.42
• Hours per week father employed	42.8	15.5	21	43.5	15.7	13	.90	.05
• Percent of mothers employed*	42.9		28	15.4		13	.09	-.49
• Percent of fathers employed as technical managerial or above*	61.5		26	45.5		11	.38	-.29
• Total household income+	$21,785	$12,728	28	$22,961	$13,022	13	.79	.09
• Percent with mother as primary caregiver*	96.4		28	100.0		13	.50	.00
• Number of siblings	2.1	1.7	28	1.8	1.0	13	.52	-.18
• Number of siblings with disabilities	.1	.3	28	.4	.7	13	.03	1.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

+ Income data were converted from categorical to continuous data by using the midpoint of each category.

^ Effect size is defined here as the difference between the groups (center + PIE minus center) on the ANCOVA scores, divided by the unadjusted standard deviation of the center-based intervention group. (See Glass, 1976; Tallmadge, 1977; & Cohen, 1977, for a more general discussion of the concept of Effect Size.) The sign of ES only indicates direction of difference; no value judgement is intended.

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Table 9.13

Comparison of Reassessment Measures of Child Functioning for Children of Parents Who Attended 11 or More PIE Instruction Sessions, and Children of Parents in the Center-Based Only Group

		Center-based only				Attended 11 or more PIE Sessions						
Variable	Covariates[a]	$\bar{X}$	(SD)	Adj.$\bar{X}$[#]	n	$\bar{X}$	(SD)	Adj.$\bar{X}$[#]	n	ANCOVA F	p Value	ES[^]
REASSESSMENT #1												
Battelle Developmental Inventory (BDI) Raw Scores for:												
Personal-Social	1,5,7[◆]	87.3	(28.0)	90.9	28	107.1	(25.6)	103.5	13	4.58	.04	.45
Adaptive Behavior	2,3,7	56.7	(15.4)	58.7	28	64.5	(12.9)	62.5	13	1.86	.18	.25
Motor	3,7	77.4	(23.9)	80.7	28	82.6	(24.1)	79.4	13	.17	.68	-.05
Communication	4,5,7	44.0	(16.4)	47.8	28	51.1	(20.8)	47.3	13	.03	.86	-.03
Cognitive	5,7	34.3	(13.7)	36.5	28	40.1	(15.1)	37.8	13	.26	.62	.09
Total	6,7	298.9	(20.1)	57.5	28	65.7	(13.7)	62.0	13	2.45	.13	.22
REASSESSMENT #2												
Battelle Developmental Inventory (BDI) Raw Scores for:												
Personal-Social	1,5,7	101.7	(23.9)	103.3	20	119.1	(20.8)	117.5	10	6.57	.02	.59
Adaptive Behavior	2,3,7	67.4	(15.7)	68.3	20	74.0	(11.8)	73.1	10	1.67	.21	.31
Motor	3,7	92.4	(20.5)	94.5	20	100.5	(18.9)	98.4	10	1.00	.33	.19
Communication	4,5,7	50.4	(17.7)	54.1	20	60.4	(19.2)	56.7	10	.38	.55	.15
Cognitive	4,5,7	41.4	(16.2)	44.5	20	52.7	(17.5)	49.6	10	2.12	.16	.31
Total	6,7	353.2	(76.4)	363.3	20	406.7	(71.9)	396.6	10	5.41	.03	.44
REASSESSMENT #3												
Battelle Developmental Inventory (BDI) Raw Scores for:												
Personal-Social	1,5	113.8	(34.7)	116.4	26	132.7	(24.3)	130.1	11	2.48	.13	.39
Adaptive Behavior	2,3	73.3	(17.8)	75.2	26	83.8	(13.3)	82.0	11	2.50	.12	.38
Motor	3	93.2	(28.1)	97.0	26	104.0	(25.0)	100.3	11	.41	.53	.12
Communication	4,5	56.8	(22.6)	59.8	26	69.5	(19.9)	66.5	11	1.47	.23	.30
Cognitive	4,5	45.2	(17.2)	47.5	26	61.5	(21.9)	59.1	11	7.31	.01	.67
Total	6	382.4	(99.1)	393.7	26	450.6	(80.2)	439.3	11	3.57	.07	.46
REASSESSMENT #4												
Battelle Developmental Inventory (BDI) Raw Scores for:												
Personal-Social	1,5	128.8	(33.9)	131.5	28	142.2	(24.0)	139.5	12	1.00	.33	.24
Adaptive Behavior	2,3	79.1	(21.6)	80.9	28	90.0	(16.0)	88.3	12	1.78	.19	.34
Motor	3	101.4	(31.8)	104.7	28	114.6	(30.8)	111.3	12	1.07	.31	.21
Communication	4,5	64.4	(23.9)	68.5	28	79.1	(23.5)	74.9	12	1.49	.23	.27
Cognitive	4,5	59.8	(26.3)	63.4	28	72.6	(23.5)	69.0	12	.83	.37	.21
Total	6	433.5	(114.6)	447.3	28	498.4	(97.2)	484.7	12	1.88	.18	.33
REASSESSMENT #5												
Woodcock-Johnson Test of Achievement-Revised (WJ-R) for:												
Broad Knowledge	5	441.2	(29.7)	444.1	28	456.9	(24.7)	454.0	12	1.42	.24	.33
Skills Knowledge	5	384.3	(54.3)	389.5	28	417.5	(51.6)	412.3	12	2.01	.16	.42
Scale of Independent Behavior												
Motor Skills	3	435.5	(38.3)	439.0	28	447.3	(33.0)	443.9	12	.31	.58	.13
Social Communication Skills	6	454.2	(25.0)	456.6	28	467.7	(21.4)	465.2	12	1.54	.22	.34
Personal Living Skills	3	454.8	(26.8)	457.1	28	461.8	(20.3)	459.4	12	.15	.70	.09
Community Living Skills	6	430.2	(28.3)	432.8	28	446.6	(27.6)	444.0	12	1.74	.20	.40
Total	6	443.7	(24.1)	445.9	28	456.0	(20.5)	453.9	12	1.32	.26	.33
REASSESSMENT #6												
Woodcock-Johnson Test of Achievement-Revised (WJ-R) for:												
Broad Knowledge	3	450.8	(31.8)	451.6	28	464.6	(27.7)	463.8	12	1.32	.26	.38
Skills Knowledge	6	398.4	(54.0)	402.9	28	433.2	(55.6)	428.7	12	2.29	.14	.48
Scale of Independent Behavior												
Motor Skills	3	440.0	(37.8)	443.5	28	447.3	(36.0)	443.8	12	.00	.98	.01
Social Communication Skills	6	457.6	(25.9)	459.9	28	468.1	(21.2)	465.8	12	.63	.43	.23
Personal Living Skills	6	458.1	(27.6)	460.0	28	466.9	(17.4)	465.1	12	.40	.53	.18
Community Living Skills	6	435.3	(28.4)	437.9	28	452.0	(24.5)	449.4	12	1.99	.16	.40
Total	6	447.9	(24.3)	450.0	28	458.8	(20.4)	456.6	12	.89	.35	.27

[a] Covariates: 1 = BDI Personal-Social Assessment; 2 = BDI Adaptive Behavior Assessment; 3 = BDI Motor Assessment; 4 = BDI Communication Assessment; 5 = BDI Cognitive Assessment; 6 = BDI Total Assessment; 7 = Child Age Assessment.

[^] $$ES = \frac{\text{Center-based + PIE Adj.}\bar{X} - \text{Center-based Adj.}\bar{X}}{\text{Center-based SD}}$$

[◆] Child's age at assessment correlated highly with the outcome measures for Assessments #1 and #2, but not at the later assessments. Therefore, it was used as a covariate only for Reassessments #1 and #2.

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Other Analyses

Parent-child interaction. Another way to investigate possible effects of this type of parent involvement program is to measure parent-child behaviors in a free-play interaction sequence. Parent-child dyads were videotaped at Reassessments #1, #2, and #4. These interaction tapings were approximately 20 minutes in length and followed a written protocol. Toys and books were provided. Most of the time was spent in free play, followed by a cleaning up of toys, joint book reading, parent leaving for 45 seconds, returning, and more free play. The videotapes were coded by two parent-child interaction rating systems; they included the Parent/Caregiver Involvement Scale (PCIS) (Farran et al., 1986), and the Parental Behavior Rating Scale (PBRS) (Mahoney, 1988). The codings were completed by persons who were supervised and/or trained by the developers of the coding systems. They were uninformed about the research hypotheses under investigation. The Reassessment #1 and #2 videotapes were coded with both the PCIS and the PBRS coding systems; Reassessment #4 videotapes were coded with the PBRS system.

The PCIS scale measures 11 parent or caregiver behaviors. These scales include: physical involvement, verbal involvement, responsiveness, play interaction, teaching behavior, control, directives, relationship among activities in which caregiver was involved, positive statements, negative statements/discipline, and goal setting. Each of these caregiver behaviors were rated separately for amount of behavior, quality of behavior, and appropriateness of behavior on 5-point Likert-type scales. The amount scores for the 11 variables were summed and averaged resulting in an amount score. Similarly, quality and appropriateness were summed and averaged. In comparing these cumulative variables for the two groups, a number of child and family characteristics were considered as potential covariates, the number of siblings in the home was the only variable with a high enough correlation to be used in the analyses. No differences were found between groups on total amount of behaviors.

The parents in the center-based with parent involvement were rated statistically significantly higher in quality of interaction than the parents in the center-based group at Reassessment #1 (p = .03, ES = .57) (see Table 9.14). The advantage for the parent involvement group on appropriateness did not reach the .10 level of significance (p = .12) but had an effect size of 1/2 a standard deviation. These videotapes of parent-child interaction took place approximately two months after the PIE instruction concluded. Because group differences in quality and appropriateness of mother's behavior were found at Reassessment #1, group comparisons were performed on the 11 individual behaviors that were observed (refer to Table 9.15). The number rated varies because the coders did not rate a behavior unless they observed it. For example, physical involvement, negative statements and regards, and goal-setting were observed in half or less of the observations. Most of the effect sizes were large (ranging from one-third to two-thirds of a standard deviation) for all behaviors except quality of verbal involvement and appropriateness of positive statements and regards. The p values indicate statistically significant differences for the quality and appropriateness scores for responsiveness, play interaction, control activities

Table 9.14

Comparison of Parental Behaviors as Coded by the PCIS (Farran) For Parents in the Center-Based Only and Center-Based with Parent Involvement Groups for Reassessments #1 and #2

		Center-Based				Center-Based + PIE						
Variable	Covariates[a]	$\bar{X}$	(SD)	Adj.$\bar{X}$[ø]	n	$\bar{X}$	(SD)	Adj.$\bar{X}$[ø]	n	ANCOVA F	p Value	ES[^]
REASSESSMENT #1												
Average Rating:												
Amount		2.8	(.6)		26	2.7	(.4)		22	.47	.50	-.17
Quality	1	3.7	(.7)	3.7	26	4.1	(.6)	4.1	22	4.06	.05	.57
Appropriateness	1	3.9	(.6)	3.9	26	4.2	(.7)	4.1	22	1.75	.19	.33
REASSESSMENT #2												
Total Rating:												
Amount		3.0	(.6)		19	3.0	(.6)		17	.05	.83	.00
Quality	1	3.9	(.9)	3.9	19	4.2	(.6)	4.2	17	.77	.39	.33
Appropriateness	1	4.1	(.9)	4.1	19	4.3	(.8)	4.2	17	.95	.51	.11

[a] 1 = Number of siblings in the home.

[e] Involvement was rated (with a Likert-type scale, range 1-5) over 11 parent/caregiver behaviors (Physical Involvement, Verbal Involvement, Responsiveness to Child, Play Interaction, Teaching Behavior, Control Activities, Directiveness/Demands, Relationship Among Activities, Positive Statements/Regard, Negative Statements/Regard, Goal Setting). Average ratings were then computed for the amount, quality, and appropriateness of the parent/caregiver behaviors.

[b] Average for general impression ratings given above.

[^] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{X} - \text{Center-based Adj.}\bar{X}}{\text{Center-Based SD}}$$

and directives given, with the mothers in the center-based with parent involvement group being rated higher than the comparison mothers. However, a year later at Reassessment #2, no differences were found between the group's parent-child interactional PCIS ratings (refer to Table 9.14).

Table 9.15

Comparison of Parental Behaviors as Coded by the Dimensions of Behavior Within the PCIS (Farran) for Parents in the Center-Based Only and P-I Groups for Reassessment #1

	Center-Based Only			Center-Based + PIE				
Dimension	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
Quality of:								
Physical Involvement*	3.7	(1.0)	12	4.3	(1.0)	12	.16	.60
Verbal Involvement	4.2	(.7)	26	4.2	(.7)	22	.72	.00
Responsiveness of Caregiver	3.8	(.8)	26	4.2	(.7)	22	.07	.50
Play Interaction	3.5	(.9)	26	4.1	(.8)	20	.05	.67
Teaching Behavior	3.3	(.9)	16	3.8	(1.0)	11	.19	.56
Control Activities	3.7	(.9)	25	4.3	(.7)	19	.02	.67
Directives & Demands	3.8	(.8)	26	4.3	(.6)	22	.03	.63
Relationship Among Activities	3.3	(.9)	26	3.7	(.8)	22	.19	.44
Positive Statements and Regards	3.9	(.7)	19	4.2	(.8)	16	.23	.43
Negative Statements and Regards*	3.9	(.7)	7	4.3	(.6)	3	.33	.57
Goal Setting*	3.6	(1.0)	9	4.0	(.7)	5	.41	.40
Appropriateness of:								
Physical Involvement*	4.5	(.7)	12	4.8	(.4)	12	.16	.43
Verbal Involvement	3.8	(.6)	26	4.0	(.8)	22	.27	.33
Responsiveness of Caregiver	3.7	(1.0)	26	4.2	(.9)	22	.10	.50
Play Interaction	3.9	(.9)	26	4.5	(.8)	20	.04	.67
Teaching Behavior	4.4	(.6)	16	4.5	(.7)	11	.68	.17
Control Activities	3.6	(.8)	25	3.9	(.7)	19	.09	.38
Directives and Demands	4.2	(.7)	26	4.6	(.5)	22	.04	.57
Relationship Among Activities	3.2	(1.0)	26	3.5	(1.0)	22	.28	.30
Positive Statements and Regards	4.5	(.5)	19	4.5	(.5)	16	.88	.00
Negative Statements and Regards*	3.3	(1.3)	7	4.0	(1.0)	3	.41	.54
Goal Setting*	4.1	(.6)	9	4.4	(.5)	5	.39	.50

* Indicates dimensions of behaviors that were not observed in half or more of the dyads.

The PBRS (Mahoney) rates 12 parental behaviors including warmth, expressiveness, enjoyment, acceptance, sensitivity to child's interest, responsivity, effectiveness, directiveness, achievement orientation, pace, inventiveness, and verbal praise. Based on a maximum likelihood factor analysis with oblique rotation (using the SPSSPC) of these 12 variables for 237 observations of parent-child interaction from the EIRI studies, 3 factors were identified which together accounted for 59.6% of the variance. Factor 1, Affective Relationship with Child, included expressiveness toward child, warmth, enjoyment of interacting with child, acceptance of child's behaviors, and inventiveness in play. For Factor 2, Responsivity to Child, sensitivity to child's interests, responsivity, inventiveness in play, and effectiveness of parent to engage child in play interaction were summed and directiveness (frequency and intensity of directives) was subtracted. Factor 3, Performance Orientation, included achievement orientation, verbal praise, pace of parent's behaviors, and intensity and frequency of directives. The reliability coefficients of the three factors were .88, .83, and .61 respectively. The three factors were compared for the two groups at Reassessments #1, #2, and #4. Covariates were included in the analyses when their correlation with the outcome variables was high. The only statistically significant difference between groups was orientation to child's interests at Reassessment #2 (see Table 9.16). Without somewhat similar findings at Reassessments #1 or #4, this difference appears to be due to chance.

Table 9.16

Comparison of Parental Behaviors as Coded by the PBRS (Mahoney) for the Parents in the Center-Based Only and Center-Based with Parent Involvement Groups for Reassessments #1, #2, and #4

		Center-based only				Center-based + PIE						
Variable	Covariates$	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	p Value	ES^
REASSESSMENT #1												
Affective relationship with child	1,2	14.5	(2.8)	14.4	26	15.5	(2.6)	15.6	19	2.22	.14	.43
Child orientation (responsivity to child)	0,2	14.2	(3.3)	14.3	26	15.1	(3.1)	14.9	20	.44	.51	.18
Performance orientation toward child	0	11.5	(2.9)	11.3	26	11.7	(3.2)	11.9	21	.47	.50	.21
REASSESSMENT #2												
Affective relation with child	1,2	14.4	(3.0)	14.2	19	15.1	(3.6)	15.3	15	1.33	.26	.37
Child orientation (responsivity to child)	0,2	13.8	(3.5)	13.7	19	15.3	(2.8)	15.5	16	3.13	.09	.51
Performance orientation toward child	0	11.4	(3.5)	11.4	19	10.7	(3.5)	10.7	16	.29	.59	-.20
REASSESSMENT #4												
Affective relationship with child	1,2	14.5	(2.6)	14.3	24	15.2	(2.6)	15.4	21	2.19	.15	.42
Child orientation (responsivity to child)	0,2	15.5	(3.6)	15.4	24	16.2	(2.1)	16.3	22	1.28	.26	.25
Performance Orientation toward child	0	9.3	(3.1)	9.2	24	9.4	(3.2)	9.5	23	.13	.72	.10

$ Covariates: 0 = Battelle Total Raw Score at Assessment; 1 = FRS Total Score; 2 = PSI Total Score

^ $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{X} - \text{Center-based Adj.}\bar{X}}{\text{Center-Based SD}}$$

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Again, to investigate whether the PIE instruction influenced parent behaviors, the ratings of interactions for those parents who attended 11 or more of the PIE sessions were compared with the ratings of the parents in the center-based only group. Again, statistically significant differences were found with the PCIS (Farran) variables at Reassessment #1. As can be seen in Table 9.17, at Reassessment #1, soon after the sessions were completed, the parents who attended 11 or more sessions had statistically significantly higher scores than did the parents in the center-based only group on quality and appropriateness of parenting behaviors, at Reassessment #2, no statistically significant differences were found. No statistically significant differences were found on the PBRS (Mahoney) factors at Reassessments #1, #2, or #4.

Table 9.17

Comparison of Reassessment Measures of Parental Behaviors of Parents Who Attended 11 or More PIE Instruction Sessions, and Children of Parents in the Center-Based Only Group

Variable	Covariates[&]	Center-based only				Attended 11 or more PIE Sessions				ANCOVA F	p Value	ES[^]
		$\bar{X}$	(SD)	Adj.$\bar{X}$[#]	n	$\bar{X}$	(SD)	Adj.$\bar{X}$[#]	n			
REASSESSMENT #1												
PCIS Average Rating (Farran)												
Amount		2.8	(.6)		26	2.6	(.5)		11	.37	.55	-.33
Quality	0	3.7	(.6)	3.7	26	4.3	(.6)	4.3	11	6.79	.01	1.00
Appropriateness	0	3.9	(.6)	3.9	26	4.4	(.7)	4.4	11	6.05	.02	.83
PBRS Factors (Mahoney)												
Affective Relationship	2,3	14.5	(2.8)	14.4	26	14.6	(2.8)	14.6	9	.04	.85	.07
Child Orientation	1,2	14.2	(3.3)	14.4	26	16.3	(3.3)	16.0	10	2.02	.17	.48
Performance Orientation	1	11.5	(2.9)	11.3	26	11.8	(3.5)	12.0	11	.49	.49	.24
REASSESSMENT #2												
PCIS Average Rating (Farran)												
Amount		3.0	(.6)		19	2.9	(.8)		9	.17	.68	-.17
Quality	0	3.9	(.9)	3.9	19	4.3	(.7)	4.3	9	1.51	.23	.44
Appropriateness	0	4.1	(.9)	4.1	19	4.4	(.6)	4.4	9	1.53	.23	.33
PBRS Factors (Mahoney)												
Affective Relationship	2,3	14.4	(3.0)	14.3	19	14.3	(3.7)	14.3	7	.00	.98	.00
Child Orientation	1,2	13.8	(3.5)	13.9	19	14.8	(2.7)	14.7	8	.46	.50	.23
Performance Orientation	1	11.4	(3.5)	11.4	19	10.0	(3.4)	10.1	8	.78	.39	-.37
REASSESSMENT #4												
PBRS Factors (Mahoney)												
Affective Relationship	2,3	14.5	(2.6)	14.3	24	15.1	(3.3)	15.2	10	.72	.40	.35
Child Orientation	1,2	15.5	(3.6)	15.6	24	15.9	(2.0)	15.8	11	.06	.81	.06
Performance Orientation	1	9.3	(3.1)	9.2	24	9.1	(3.7)	9.2	12	.00	.95	.00

[#] Covariance adjusted means

[&] Covariates: 0 = # of Siblings in Family; 1 = Battelle Total Raw Score at Assessment; 2 = PSI Total; 3 = FRS Total

[^] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{X} - \text{Center-based Adj.}\bar{X}}{\text{Center-Based SD}}$$

In sum, the parent/child interaction findings are mixed, depending on the rating system used. Over all the reassessments, the rating system variables do not reflect differences in parent behaviors between the groups. However, using the PCIS coding system, statistically significant differences were found at Reassessment #1, soon after the parent involvement program was completed, in both the group comparison (center-based only vs. center-based with parent involvement) and the participation comparison (high attenders vs. center-based only). The statistical significance of these differences did not remain at Reassessment #2. Possibly the content of the PIE instruction helped the parents in their interaction with their children for a short period of time.

Conclusions and Discussion

The primary purpose of this investigation was to ascertain the immediate and long-term effects on children with disabilities and their families of the addition of a particular parent involvement program to a center-based early intervention program. In order to do so, two groups of parents and their children with disabilities were randomly assigned to one of two groups. All children attended a center-based early intervention program. The parents of half of the children participated in a parent involvement program. In this type of parent involvement program, the parents were taught to provide therapeutic intervention services for their children and to be more effective partners in the intervention process. The parent involvement sessions also offered the parents an opportunity to form support networks with each other and discuss concerns. This longitudinal study was methodologically sound with random assignment to treatment, treatment verification measures, multiple child and family measures, and "blind" assessment at all reassessments. The two groups were well-matched on demographic, child, and family measures when the study began. The analyses of intervening contextual variables revealed no significant group differences on intervening demographic or family measures, or additional services, thus controlling, for historical threats to the research findings. Child development effects, and family effects, are summarized and discussed below.

Summary of Findings

Parents were the ones actually involved in the additional intervention. Influencing parent behaviors, abilities, and attitudes were goals of the intervention. Parental changes in these areas were, in turn, to affect changes (i.e., improvement) in child development. Parent effects will be discussed first, followed by child effects. Specifically, we investigated whether the parent involvement program influenced (a) parent behaviors interacting with child, (b) perceived social support, (c) parenting stress, (d) family functioning, and (c) participation in the child's education.

Change in parent interactional behaviors was measured by two rating systems. With the PCIS rating scale (Farran et al., 1986), parents in the center-based with parent involvement group were found to demonstrate better quality and appropriateness in their interaction with the child. Much greater group differences were demonstrated at the first reassessment than at the second reassessment. However, differences between the two groups' interactional behaviors were not found when rated by the PBRS (Mahoney, 1988) at the first, second, or fourth reassessment. Involvement in the PIE program with the discussions of child growth and development and ways to provide intervention to their children, possibly influenced the parental behaviors for a short time.

The measure of social support showed the same trend of there being significant differences between groups at the first assessment but not at the second or later assessments. Higher levels of social support were reported at the first assessment at the conclusion of the intervention (assessment 1) by the parents in the parent involvement group than by the other parents. However, at the second assessment, no statistically significant group difference in reported social support existed. These results are logical. The parents reported more social support when they were involved with the professional and other parents in the group, but not when the group was no longer functioning.

Likewise, the parents in the center-based with parent involvement group reported statistically significantly higher levels of family cohesion than did the other parents at reassessments #1 and #2, but not at later reassessments. The group difference was greater at the first reassessment than at the second. We have difficulty interpreting the family cohesion score differences. Perhaps attending the class encouraged perceptions of family cohesion, but usually only one parent (the mother) attended the classes, and none of the curricula seemed to target family cohesion per se. If there is a generalized effect on family cohesion, it seems likely that there might also be one on family adaptability, but there was not. However, others are finding the adaptability portion of the FACES III scale problematic (Ben-David, 1991; Green, 1991). The cohesion finding might be a secondary effect of the intervention, but this finding needs to be systematically investigated in other studies.

The later measures of family functioning, the Family APGAR, and the Family Functioning Style Scale, did not reveal any group differences in perceptions of family functioning. These measures were taken either four or five years after the intervention ended. It is impossible to know whether there would initially have been a difference, or if the lack of difference might be due to the interval of time between the intervention and the data collection.

The parent involvement program appears to have had no effect on parent stress as measured by the PSI or the mother's depression as measured by the CES-D on the first reassessment. However, many of the items in the PSI scale that measure the parent's perception of what the child brings to the parent-child relationship (child stress domain) appear to deal with characteristics common to all children with disabilities (Innocenti, Huh, & Boyce, 1991), and might not be amenable to change, regardless of the type of intervention program. The parent domain of stress (i.e., the other relationships in a parent's life that parenting this particular child might impact) appears to be related to other contextual aspects of the parent's life (e.g., perceptions of resources, support, other life stressors, and family cohesion than it is to any characteristics of the child (Boyce, Behl, Mortensen, & Akers, 1991). These other aspects of a parent's life, with the exception of the provision of social support, might not easily be affected by this type of group involvement program.

To understand how the parents perceived the involvement program, they were interviewed at the second assessment concerning the program (refer to Treatment Verification section). Seventeen of the 20 in the parent involvement group who participated in the second assessment were interviewed. The majority reported less stress in their lives after the instruction (11) or no change in stress (2 parents). Fourteen of the 17 parents reported that they felt the PIE program positively influenced their interactions with their children, with these parents claiming greater objectivity and more effective use of reward and punishment. While there is no psychometric measure of validity or reliability for these interviews with parents who participated in the parent involvement component, these findings are interesting. Albeit their answers may have been influenced by their desire to give the "socially appropriate" answer, their perception of positive influence on their interaction with their children corroborates our findings of differences in quality and appropriateness of parent interactional behavior. That most parents reported less stress suggests that the involvement program possibly alleviated parents' perception of stress, but not in a way that was measured by the PSI or the CES-D.

Beneficial effects on parents' attitudes toward, and their participation in, their child's educational program could also be expected from a program which taught parents to be effective partners in intervention. The two groups varied statistically significantly on the teacher's evaluation of the parents' knowledge, support, and attendance. At Reassessment #4, the parents in the parent involvement program were judged to be more knowledgeable, supportive, and attend more of the educational meetings than did the parents in the center-based only group. However, these findings were not replicated at Reassessment #5 or #6. The questionnaire for Reassessment #4 was revised for Reassessments #5 and #6. The difference in questionnaires might account for the findings not being replicated. The question of whether the parent involvement group participation sets the stage for the parent's later participation in their children's education need further investigation.

Benefits in child development are probably the primary desired outcomes. Advantage for the children of the parents participating in the program was not apparent at the first assessment, but some benefits were found at the second assessment. With the parents just completing the classes at the first assessment, it is questionable whether enough time had lapsed for any new parental behaviors, attitudes, etc., to impact child development. Maybe a certain amount of lag time is needed for any parenting changes to affect child changes. Child outcome advantage for the center-based with parent involvement group is seen across reassessments on measures of achievement, social skills, and school placement; however, the advantage appears to decrease with time, with fewer differences being statistically significant at the later reassessments. This finding also needs replicative investigation.

Implications

The results of this investigation provide important information and considerations for intervention program evaluation and selection. First, some positive benefits were found. For the parents, certain benefits were evident for the parent involvement group at the conclusion of the parent involvement program. The concepts of the PIE curriculum had been learned and retained by the parents (refer to Treatment Verification section). Benefits in terms of social support and family cohesion were reported. Parents demonstrated better quality and appropriateness interacting with their children. Also, a year later, parents still perceived that the PIE program positively influenced their interactions with their children and lessened their stress. However, most of these benefits were not evident at later reassessments. For the children, limited gains in child development were found for children whose parents participated in the parent involvement program after the first reassessment. The benefits, however, appear to be limited and are possibly more limited than this study shows. Two replicative studies, the Utah Parent Involvement 1985 study (Boyce, 1990) and the Des Moines Public Schools Parent Involvement study (Innocenti, 1991), using the same PIE instruction component, found fewer benefits than did this study.

In evaluating the value of these "limited benefits," it appears to be important to ask the question of whether long-lasting benefits for children or parents can be logically expected considering the limited duration and intensity of this particular type of parent involvement. In all three studies, the parent involvement component was limited to a short period of approximately 15 weeks, which length is typical for these types of parent involvement programs. With the desire to affect change through intervention it appears that expected benefits are often over-estimated.

Second, the cost-effectiveness of this type of involvement program should be considered. Do the limited benefits justify the expense to the agency and time of the participating parents? The cost of the agency was minimal; most of the cost was borne by parents in terms of travel expenses and time. However, as research has demonstrated, the time of parents of children with disabilities is already taxed in caring for their children (Boyce & Barnett, 1991; Smith, 1986). Therefore, the involvement of parents' time must be considered.

A third consideration is whether the statistical differences found in child development reflect any meaningful educational differences for these children. Often statistically significant differences in actuality represent only a gain of a percentile or two on a developmental measure. Is a gain of a point or two educationally significant in terms of time and cost? Even if one only considers those effect sizes that were statistically significant in favor of the parent involvement group, the mean scores for the children in the parent involvement group were raised less than two percentile points. However, gains with children with moderate to severe disabilities are notoriously difficult to achieve.

The limited participation by parents in a group involvement program is further consideration. All families may not find the program pertinent to their needs. The attendance data at the parent involvement sessions indicate that the families felt differently about attending. Others have reported significant dropout from parent programs (Stiles, Cole, & Garner, 1979). There is great heterogeneity among families of children with disabilities (Foster & Berger, 1985), and their perceived needs, competing priorities, and family ecological contexts differ greatly. All of these factors influence how the families view and participate in parent involvement programs (c.f., Robbins, Dunlap, & Plienis, 1991). Parents' class participation and their implementation of assignments were probably influenced by how close the class activities matched their perceptions, needs, priorities, and values.

A fifth concern is the complex issue of learning and implementation. It can be observed in many types of "instruction situations" that people learn concepts, but do not apply them to their lives. It appears that concepts must be considered relevant before they are implemented. Also, it is reasonable to support that implementation was heightened during the instruction sessions with the "newness" of the concepts and the need to report the completion of assignments. In many learning situations, implementation lessens over time as other stresses and priorities impact the learner's time.

A final concern is whether other benefits measured in this study are derived from participating in this type of involvement program. Possibly this type of involvement program is a good introductory program for a family when the child enters a center-based program. Parent attitudes toward the center and their cooperation and participation with the intervention may be enhanced through such a program. It would also provide a way for the professionals at the center to get acquainted with the family and be better able to assess their needs.

Choosing the best intervention program for a given time and service is a difficult process because no one program provides a panacea. Each intervention component involves different benefits and costs in time, money, and outcomes. There are many aspects to consider in determining the value of this limited parent involvement program. The program provided immediate impacts on parent perceptions and behaviors. It also appears to have investigated long-term, albeit limited, benefits in child development. The findings concerning participation in this children's later schooling indicate a potential long-term beneficial impact on parent advocacy. The costs of the program are minimal. For these reasons, it appears that this type of parent involvement program results in sufficient benefits to justify a place in the array of interventions offered, but one should not claim that center-based intervention programs will be substantially more effective if this type of parent involvement program is included.

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